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2000 Committee of Provincial Geologists ..... *inside rear cover*

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Committee of Provincial Geologists Chairperson's Report 2000

The Committee of Provincial Geologists (CPG) is an organization of senior executives of the provincial and territorial geological surveys.

Under the British North America Act, 1867, minerals are a provincial responsibility. Therefore, all the provincial and territorial geological surveys have a strong service and product focus in support of the mineral industry. In addition, the provincial and territorial geological surveys function as the principal source of basic geological knowledge source for their jurisdictional governments' executive, legislative, and judicial branches, in addition to the mineral industry. Some provincial and territorial geological surveys have regulatory responsibilities for water and oil and gas.

In the spirit of cooperation, CPG works closely with our federal cou terpart, the Geological Survey of Canada, to capitalize on the complementary and differing mandates. This cooperation, guided by the Intergovernmental Geoscience Accord (September 1996), enhances the competitiveness and economic and social well-being of each respective jurisdiction and Canada through the documentation of, and access to, high quality geoscience data and knowledge.

Key activities addressed by, or affecting, Committee of Provincial Geologists during the 2000 calendar year include:

Changes to CPG:

Jan Boon served the function of NGSC Liaison until fall 2000. In the fall 2000, Jan Boon accepted the position of Director General, Sedimentary and Marine Geoscience Branch. Jan was instrumental in moving the NGSC agenda forward and his selfless efforts are much appreciated by all CPG, especially the Chair of CPG. Jan Boon's efforts as the NGSC Liaison coordinator follow upon the excellent federal – provincial relationships built by Mike Cherry who served the predecessor function for several years. This function is critical to ensure communication and awareness between the managers and scientific staff of the GSC and provincial/territorial geological surveys. Efforts are underway to fill this vacancy.

David Scott replaced Gordon MacKay as the CPG Representative for Nunavut. David is the Chief Geologist, Canada-Nunavut Geoscience Office.

Alain Simard joined CPG as the Directeur p.i., Direction de la recherche géologique, Ministere des Resources naturelles, Gouvernment du Quebec. Alain replaces Jean-Louis Caty who served the CPG very well.

Ric Syme joined CPG in the fall in his capacity as Acting Director, Manitoba Geological Survey, Manitoba Industry, Trade and Mines. Ric replaces Christine Kaszycki who assumed the role as Assistant Deputy Minister.

Provincial Geologists Medal:

At the September 2000 Energy and Mines Ministers Conference in Toronto, the Provincial Geologists Medal was presented to Sean O'Brien, a geoscientist with the Geological Survey of the Newfoundland Department of Mines and Energy.

Intergovernmental Geoscience Accord (IGA):

The first agreement was signed in September 1996. This five-year agreement expires in September 2001. A draft of the second IGA was developed by September 2000. Additional work on the language of the final agreement is required in an effort to achieve buy-in from all provincial-territorial and federal governments.

Cooperative mapping Strategy:

CPG was active on an industry-led task force charged by the Intergovernmental Working Group on the Minerals Industry (IGWG) to investigate the state of the Canadian geoscience knowledge base, alternative funding arrangements for geological surveys, and the effort required to arrest the decline of the Canadian geoscience knowledge base.

The Cooperative Mapping Strategy (CMS) was presented at the 57th Mines Ministers' Conference held in Toronto, Ontario, in September 2000, as per the recommendation by the National Geological Surveys Committee, in consultation with industry, as the solution to address the decline in Canadian geoscience knowledge base. The goal of the Cooperative Geological Mapping Strategies is to ensure that enhancing the geoscience knowledge base will play a key role in re-establishing Canada as a pre-eminent global destination for exploration dollars and in providing a sound basis for resource stewardship.

Implementation of the Cooperative Geological Mapping Strategy is predicated on the availability of new funding, and it is envisaged that both levles of government will make equal contributions. While different funding ratios may be negotiated, both levels of government will provide new funding where possible.

Targeted Geoscience Initiative:

CPG worked with GSC to develop projects to deliver during summer 2000 under the Targeted Geoscience Initiative.

In the spring 2000 federal budget, the federal government announced a $15 million allocation assigned to the Targeted Geoscience Initiative. This funding represented an initial federal investment in support of geoscience studies and the Cooperative Mapping Strategy.

Key elements of TGI included cooperation between provinces/territories and the GSC, joint project delivery, and stakeholder advice key to federal government programming.

A list of 2000-2001 projects funded under TGI is available on the internet at: http://www.NRCan.gc.ca/css/imb/hqlib/200054ea.htm

Canadian Geoscience Knowledge Network (CGKN) Highlights:

- Alain Simard accepted the role as CPG lead on the CGKN portfolio;
- CGKN updates are posted at http://cgkn.net
- In September 2000, NGSC approved the establishment of a CGKN Secretariat, coordinated by John Broome (Head, Earth Science Sector GeoInformatics / CGKN Secretariat, ESS-Info, Earth Sciences Sector, Natural Resources Canada. The 3-person Secretariat is responsible for coordination of CGKN activities and projects, liaison with GeoConnections, marketing and communication, maintenance of the CGKN Home Page, and CGKN financial administration. The Secretariat consists of John Broome (GSC), James Rupert (GSC), and a rotating provincial member, currently Eric Grunsky (AGS). The Secretariat reports to NGSC and the Steering Committee.
- CGKN prepared a business plan;
- GeoConnections is considering support for CGKN – the preliminary response to the CGKN proposal is very favourable;
- CGKN supports the On-line Geoscience Data Catalog Project, a comprehensive catalogues containing metadata describing all government geoscience data;
- The federal-provincial CGKN Data Integration Working Group addresses solutions for technical issues related to CGKN Implementation.

Meetings with GSC:

CPG met in Toronto in March 2000 (PDAC) and in Toronto in September 2000 (Energy and Mines Ministers Conference). Each of these meetings involved, or immediately preceded, a meeting that included our colleagues from the Geological Survey of Canada (Natural Resources Canada) under the auspices of the National Geological Surveys Committee (NGSC).

Committee Work:

CPG members represent the interests of the provincial/territorial geological surveys and constituents on several committees, including, but not limited to: the federal Minister's National Advisory Board on Earth Sciences, Canadian Mining Industry Research Organization, Lithoprobe, and the Canadian Geoscience Council.

Provincial Geologists Journal:

Once again, British Columbia professionally produced the 2000 Provincial Geologists Journal. The Chair extends his gratitude to Mr. Brian Grant for his patience and persistence in assembling the Provincial Geologists Journal.

Andy Fyon
CPG Chair, 2000

PROVINCIAL GEOLOGISTS MEDALIST 2000

SEAN J. O'BRIEN

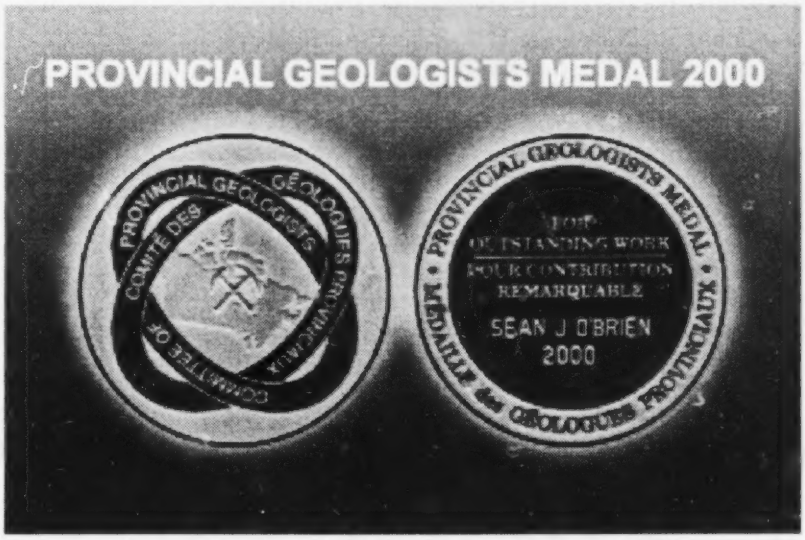
Sean O'Brien (right) receiving the Provincial Geologists Medal from the Honourable Tim Hudak, Co-chair of the Mines Ministers Conference and Minister of Northern Development and Mines for Ontario.

The Provincial Geologists Medal is awarded to recognize major contributions in the area of geoscientific research and related developments or applications that serve to meet the mandate of Canada's provincial and territorial Geological Surveys. Each Survey may nominate a candidate each year, and an external national selection committee representing industry, academia and the GSC chooses the recipient from the pool of nominees. For 2000, the winner of the Provincial Geologists Medal was Sean J. O'Brien of the Geological Survey of Newfoundland and Labrador, a division of the Department of Mines and Energy, Government of Newfoundland and Labrador. The citation below was read by Dr. Andy Fyon of the Ontario Geological Survey and Chairman of the Committee of Provincial Geologists during the medal presentation at the 57th annual Energy and Mines Ministers Conference in Toronto, September 12, 2000.

CITATION

Sean O'Brien is that quintessential Survey geologist: meticulous mapper, prodigious researcher and proficient communicator. In the more than two decades of dedicated work with the Geological Survey of Newfoundland and Labrador, his breadth of achievements ranges from articulating aborted Proterozoic rifting to defining gold-bearing quartz veins in epithermal alteration zones. Through it all, he has published maps, reports and papers of exceptional clarity, and has effectively communicated his findings to a local, national and international audience.

Sean is acknowledged in Canada, Europe and the United States as one of the pre-eminent experts on the Avalon Zone of the Appalachian Orogen, that exotic piece of Gondwanaland that predates Iapetus. His mapping of the Avalon and Burin peninsulas has significantly contributed to our understanding of the Neoproterozoic tectonostratigraphic, paleoenvironmental and metallogenic evolution of Avalonia. Further, his careful work with



Obverse and reverse images of the 2000 Provincial Geologists Medal.

colleagues in the Hermitage Flexure area of southwestern Newfoundland has defined the chronology of Neoproterozoic to Silurian orogenesis in that region, and has redefined the extent of the Avalon Zone in the Newfoundland Appalachians.

Sean O'Brien has increased the effectiveness of his body of work through mutually beneficial partnerships with other researchers and geoscience agencies. University researchers in Britain, France, Spain and the United States are important collaborators. These alliances have furthered his and their understanding of the architecture of the Avalon Zone, including its potential to host mineral deposits. In the latter regard, and especially in recent studies of epithermal alteration zones, Sean has worked closely and successfully with the Geological Survey of Canada. In fact, these GSC–GSNL joint projects are commonly touted as a model for federal–provincial geoscience cooperation.

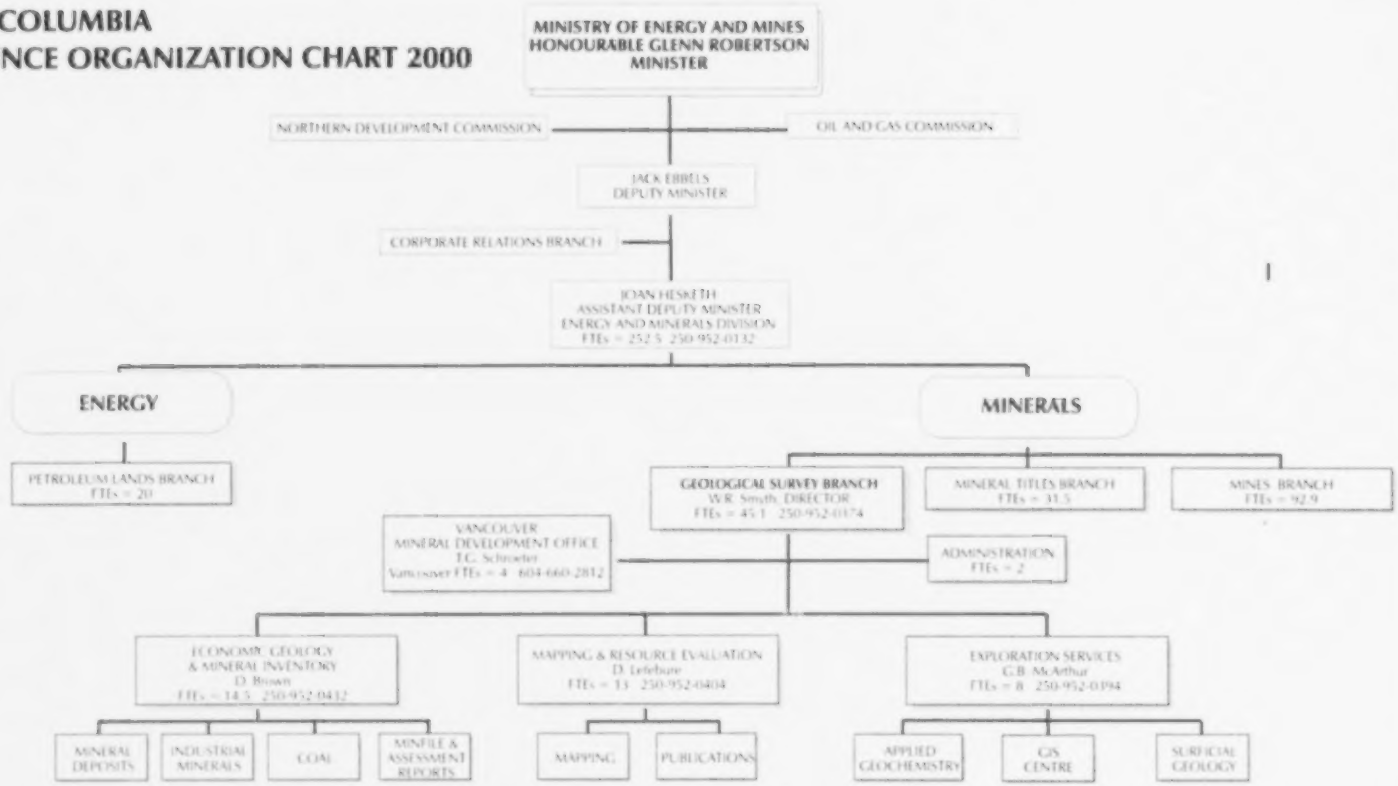
Equally important to Sean's role as a Survey geologist has been his dynamic support of Newfoundland's growing prospecting fraternity and junior exploration industry. He has proved to be a most patient mentor who deciphers the complexities of mineralization for eager acolytes, and inculcates a passion for mineral exploration in the novice and veteran alike. Many prospectors and geologists who have benefitted from Sean's tutelage have made important discoveries, and have pursued joint ventures and other avenues of property development. Now when they visit the offices of the Geological Survey, they can avail of a "prospectors resource room", another initiative co-led by Sean O'Brien to support mineral exploration in the province.

For his impressive body of scholarly work, for his several productive collaborations with government and university researchers, and for his untiring support of prospectors and mineral exploration, Sean O'Brien is eminently deserving of the 2000 Provincial Geologists Medal.

GEOSCIENCE ORGANIZATION CHARTS - 2000

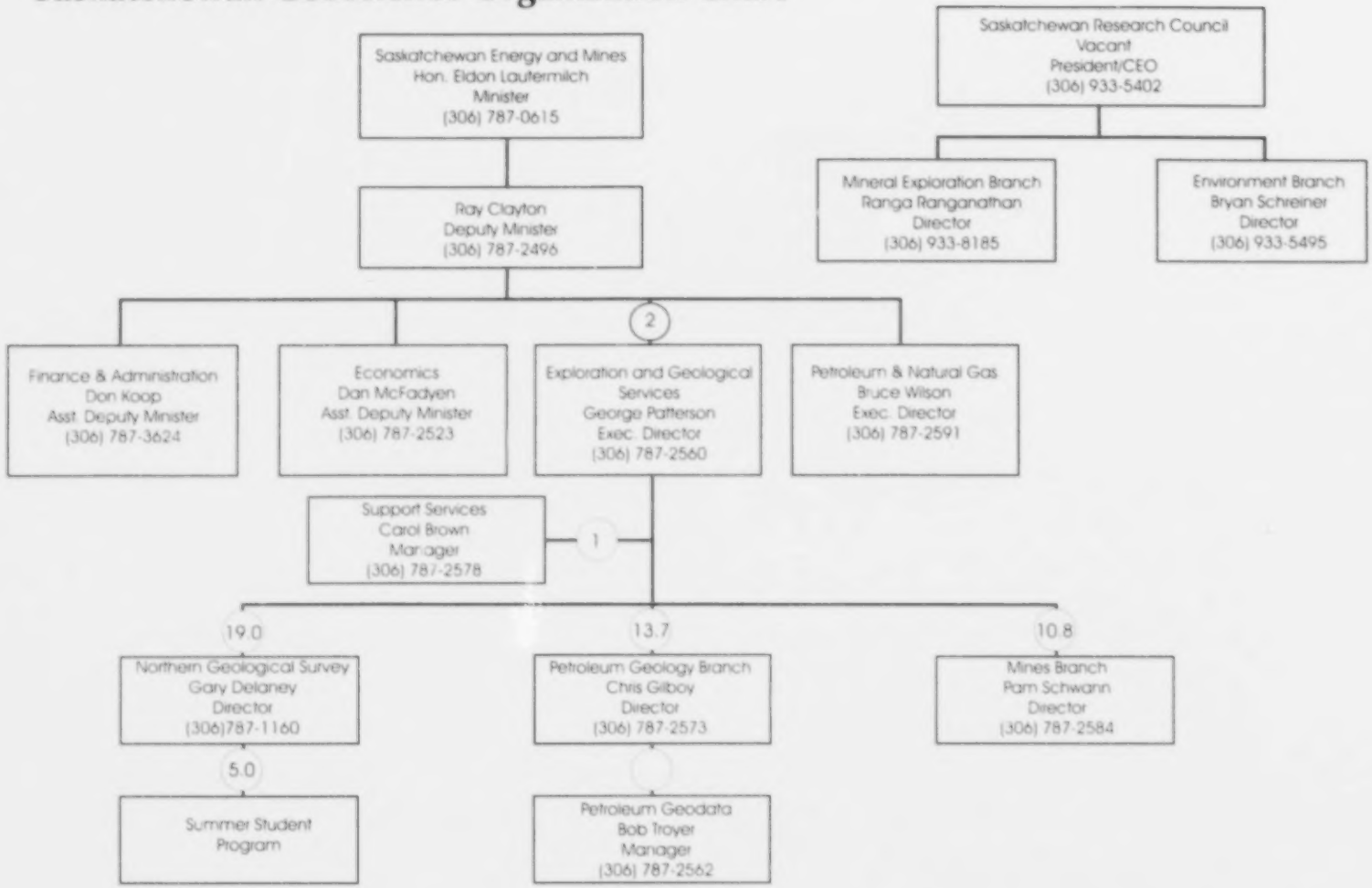
Each Provincial and Territorial government in Canada has developed its own organization structure for conducting geoscientific survey and research work. Some provinces have what is formally called a 'Geological Survey', but in most jurisdictions the main elements of the geological survey function are embraced in one or more Branches or Divisions of provincial Mines/Energy/Natural Resources departments. The following organization charts are set out to help clarify access to geoscience services for potential clients. The charts contain reference to the lines of reporting for the various units in each hierarchy, the staffing associated with each separate jurisdiction, and the names and telephone numbers of key individuals in each system.

BRITISH COLUMBIA GEOSCIENCE ORGANIZATION CHART 2000



Alberta Geoscience Organization
(September 2000)
Minister of Resource Development
The Honourable
Mike Cardinal
Department of
Resource Development
Ken Smith, DM
403-427-8032
Alberta Energy & Utilities Board
Neil McCrank, Chair
403-297-8311
Oil Development
Ta lor, DM
Forestry & Mineral
Development
D Keech, DM
Gas and Alberta
Markets
S en er, DM
Resources Branch
T Hur t
403-297-8 70
Alberta Geological Survey
ichard on
780-427-1980
Resource Appraisal
C Hill
403-297-820
Energy
Minerals
Surficial
Mapping
Geochemistry
Mineral
Assessment
Oil Sands
Coal Bed
Methane
Hydro
Geology
Program Support
Information
Dissemination
Geographical
Information
Systems
Information
Technology

Saskatchewan Geoscience Organization Chart



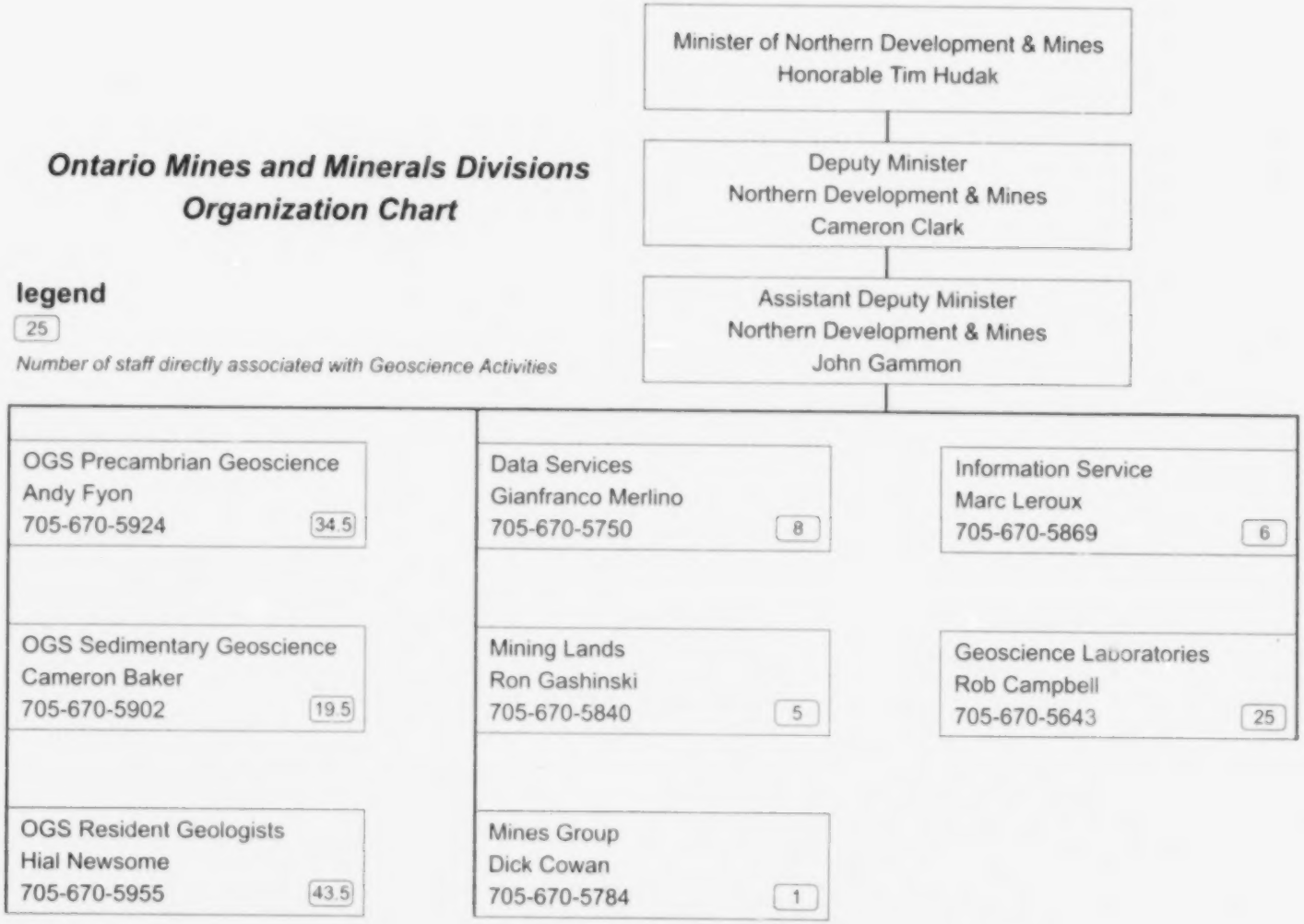
Manitoba Geoscience Organization Chart
2000 - 2001
52.1 Total staff
4 Geological staff
(5) Non-geological staff
MINISTER
Industry, Trade and Mines
Hon. MaryAnn Mihychuk
(204) 945-0067
MINING BOARD
DEPUTY MINISTER
Hugh Eliasson
(204) 945-4076
ASSISTANT DEPUTY MINISTER
MINERAL RESOURCES DIVISION
Christine Kaszycki
(204) 945-4317
9.0
30.5
MINES BRANCH
DIRECTOR
Ernie Armitt
(204) 945-6505
ADMINISTRATION OPERATIONS
UNIT
Manager: vacant
52.1
MANITOBA GEOLOGICAL SURVEY
ACTING DIRECTOR
Ric Syme
(204) 945-6556
1
3.0
MINERALS SUPPORT UNIT
MANAGER
Gary Ostry
(204) 945-6564
GEOSCIENCE INFORMATION
Paul Lenton
(204) 945-6553
6
4
PRECAMBRIAN MAPPING
Chief Geologist: vacant
9
SEDIMENTARY AND
INDUSTRIAL MINERALS
Chief Geologist: vacant
9
ROCK PREPARATION
LABORATORY
Doug Berk
(204) 945-6550
(5)
MINERAL DEPOSITS
Chief Geologist: vacant
8
THOMPSON OFFICE
Chris Beaumont-Smith
(204) 677-6880
4.0 PY listed in PM and MD sections
FLIN FLON OFFICE
Tom Heine
(204) 687-1635
2.0 PY listed in MD section
CLIENT SERVICES
Monique Lavergne
(204) 945-6551
(5)
SUMMER STUDENTS
5.1

Ontario Mines and Minerals Divisions Organization Chart

legend

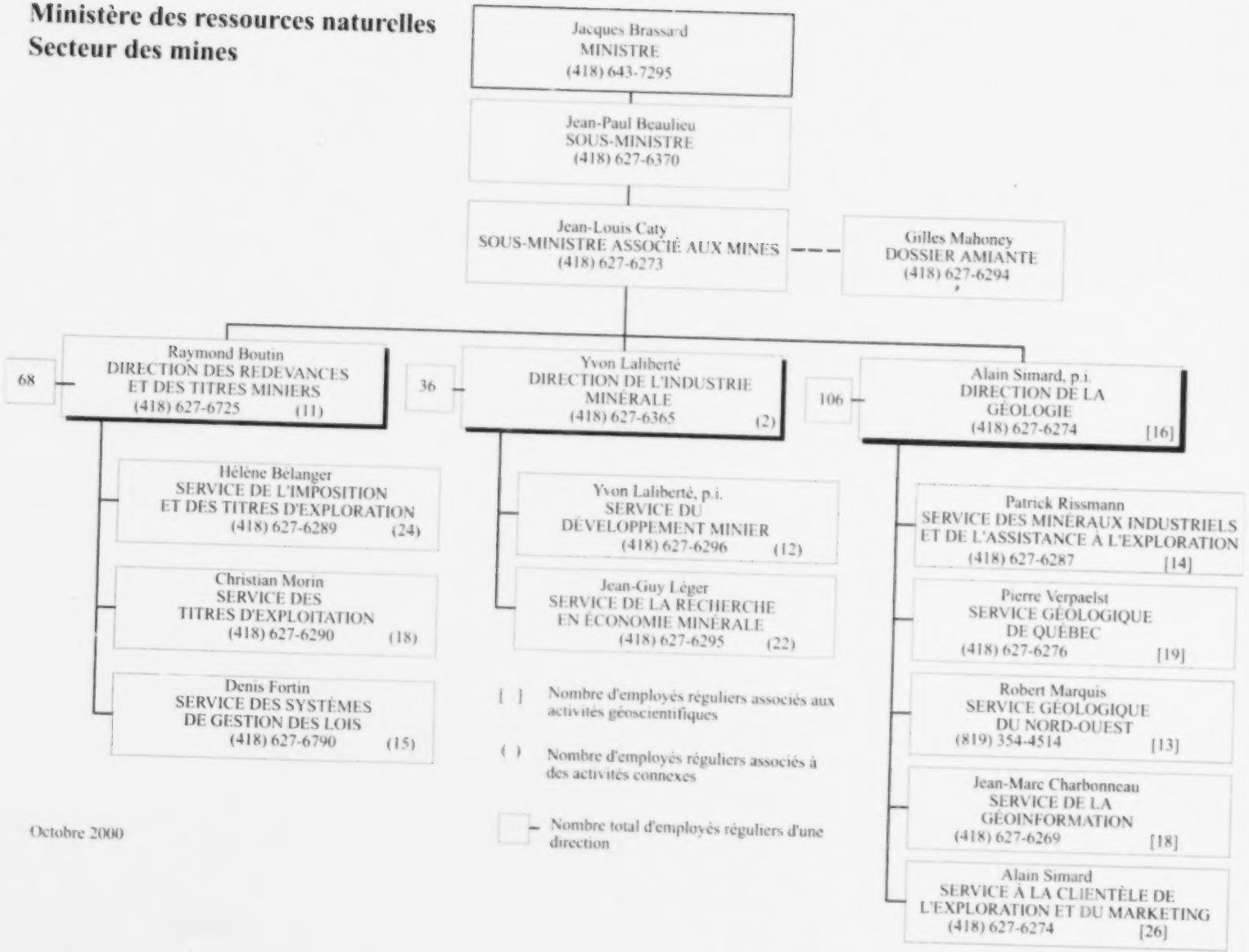
25

Number of staff directly associated with Geoscience Activities



Quebec Geoscience Organization Chart 2000

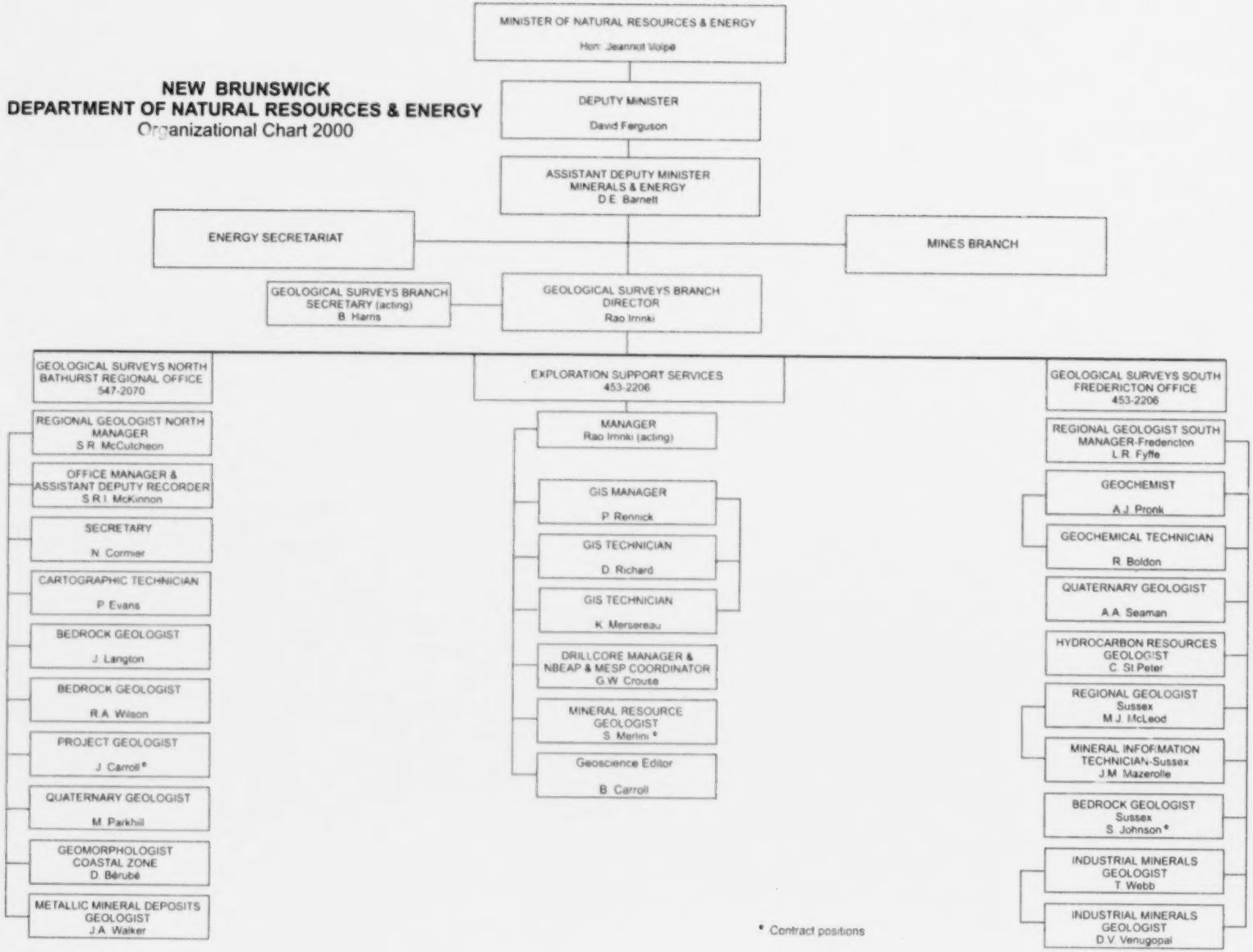
Ministère des ressources naturelles
Secteur des mines



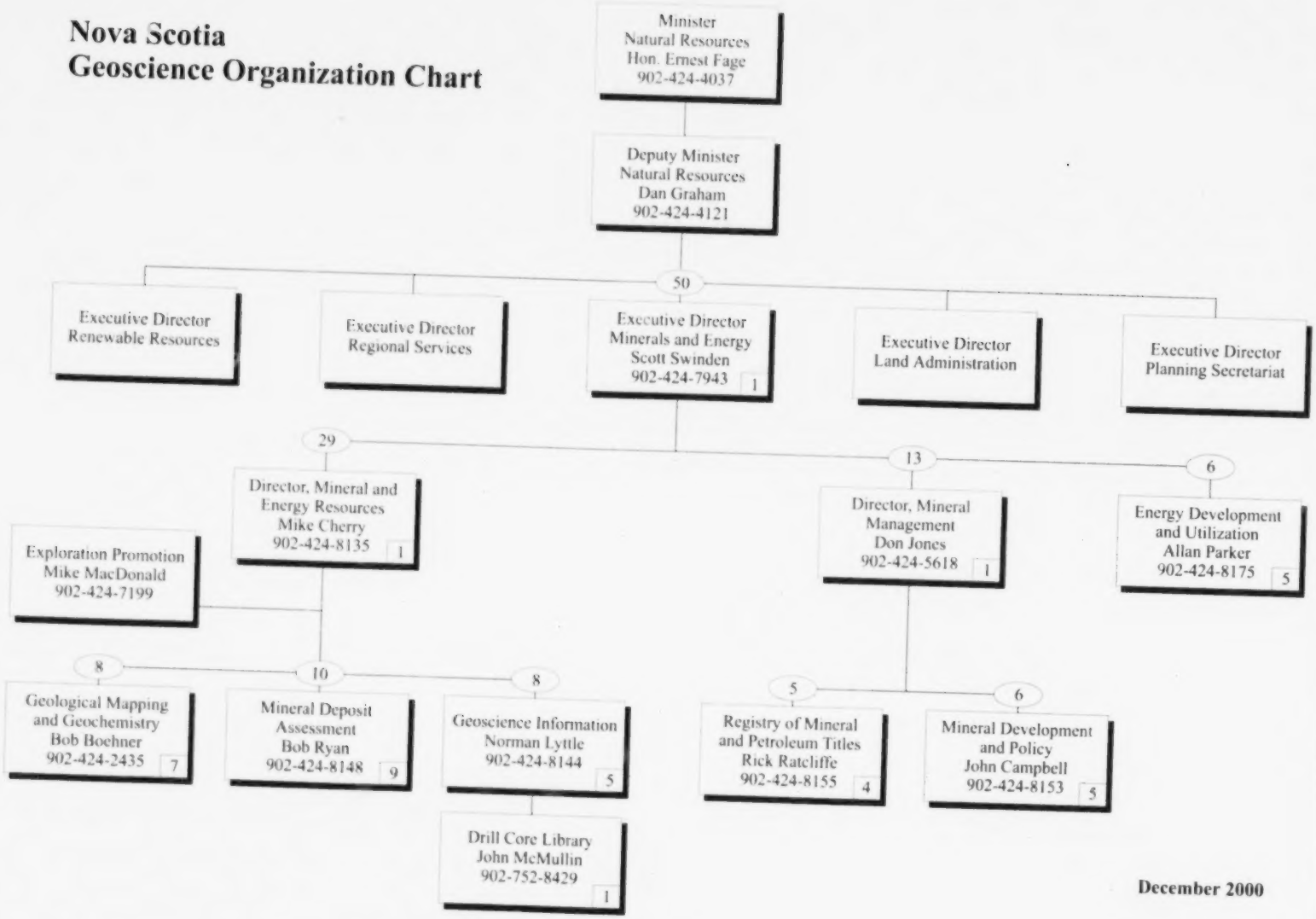
Octobre 2000

New Brunswick Geoscience Organization Chart 2000

NEW BRUNSWICK
DEPARTMENT OF NATURAL RESOURCES & ENERGY
Organizational Chart 2000



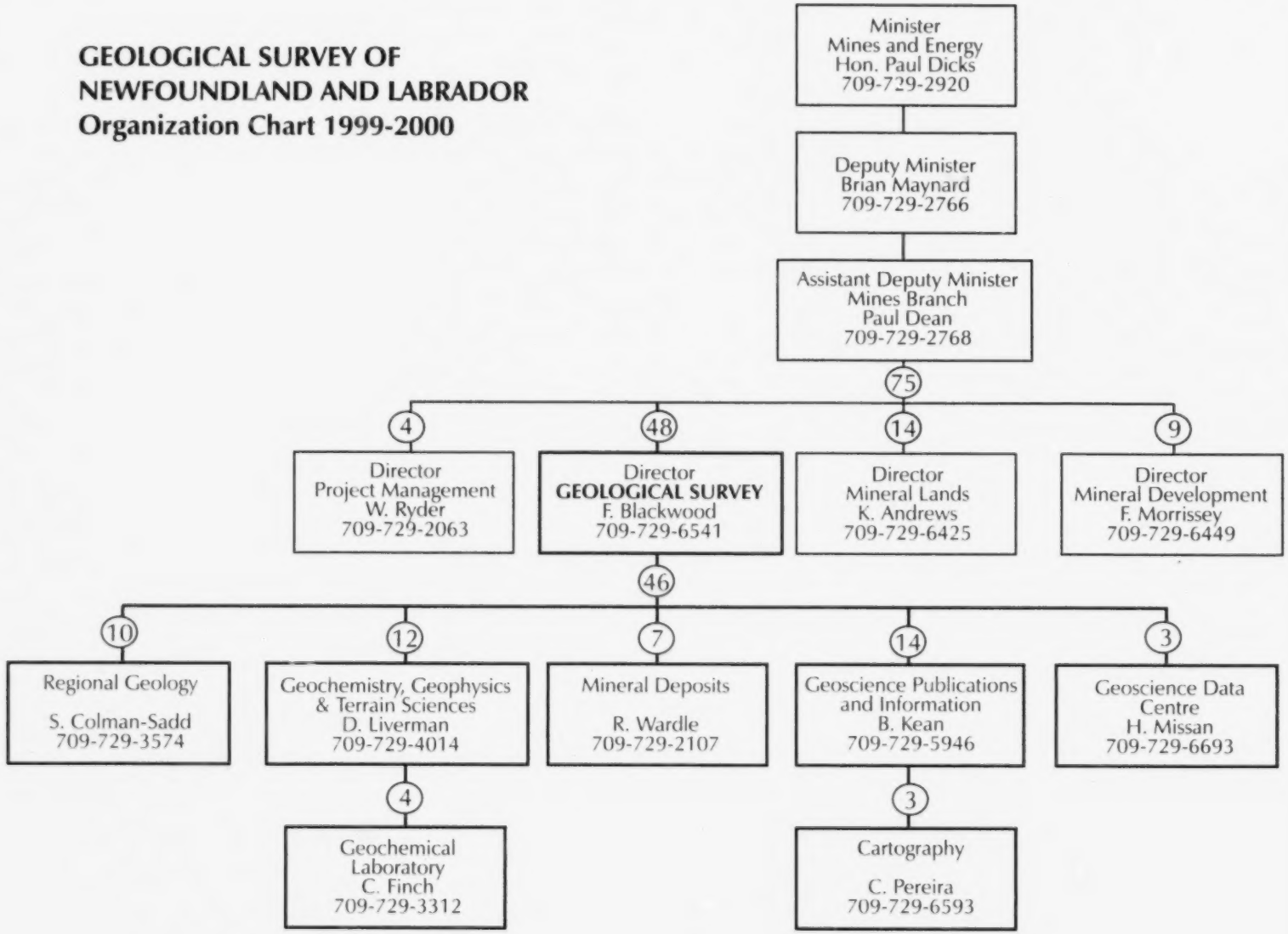
Nova Scotia Geoscience Organization Chart

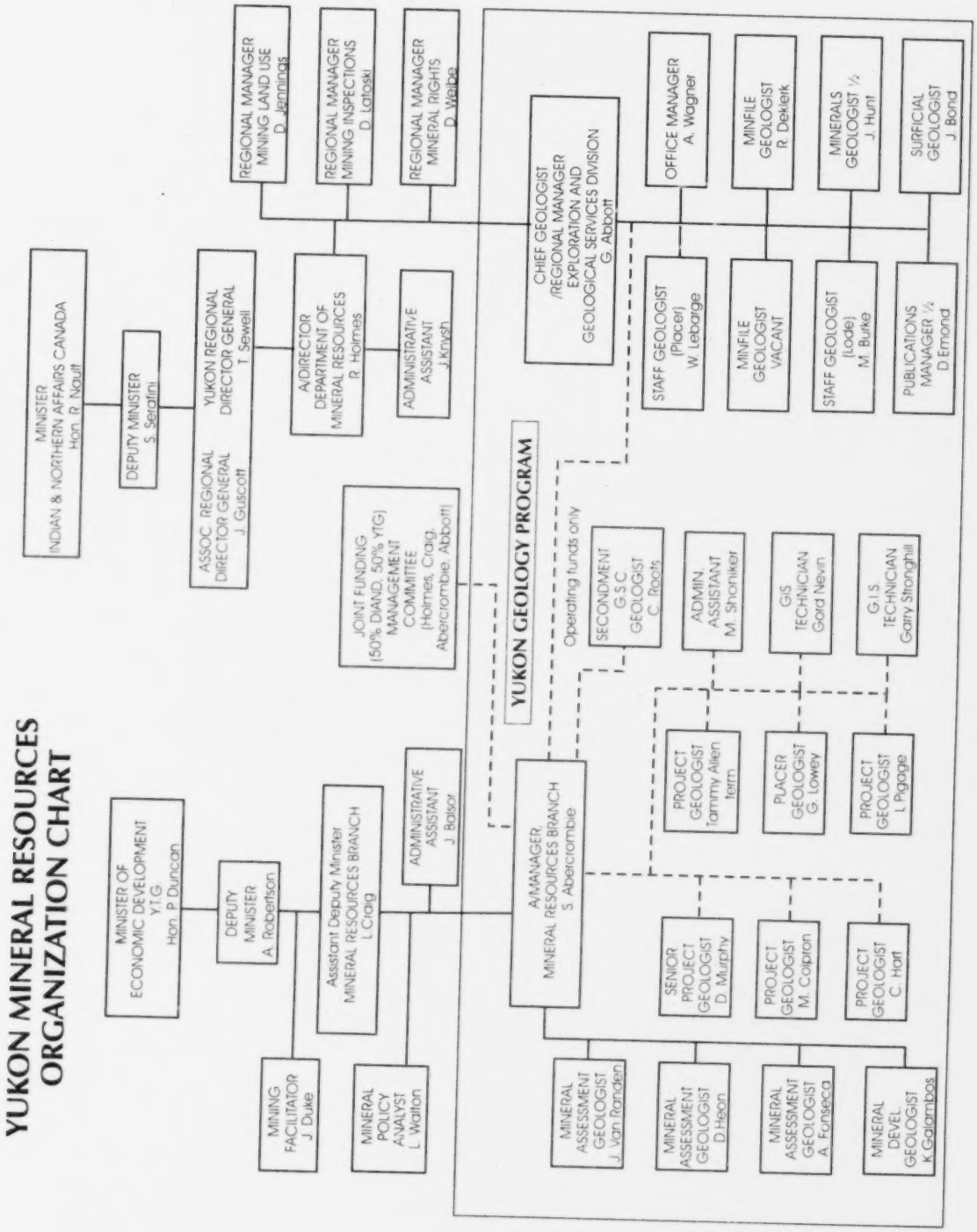


December 2000

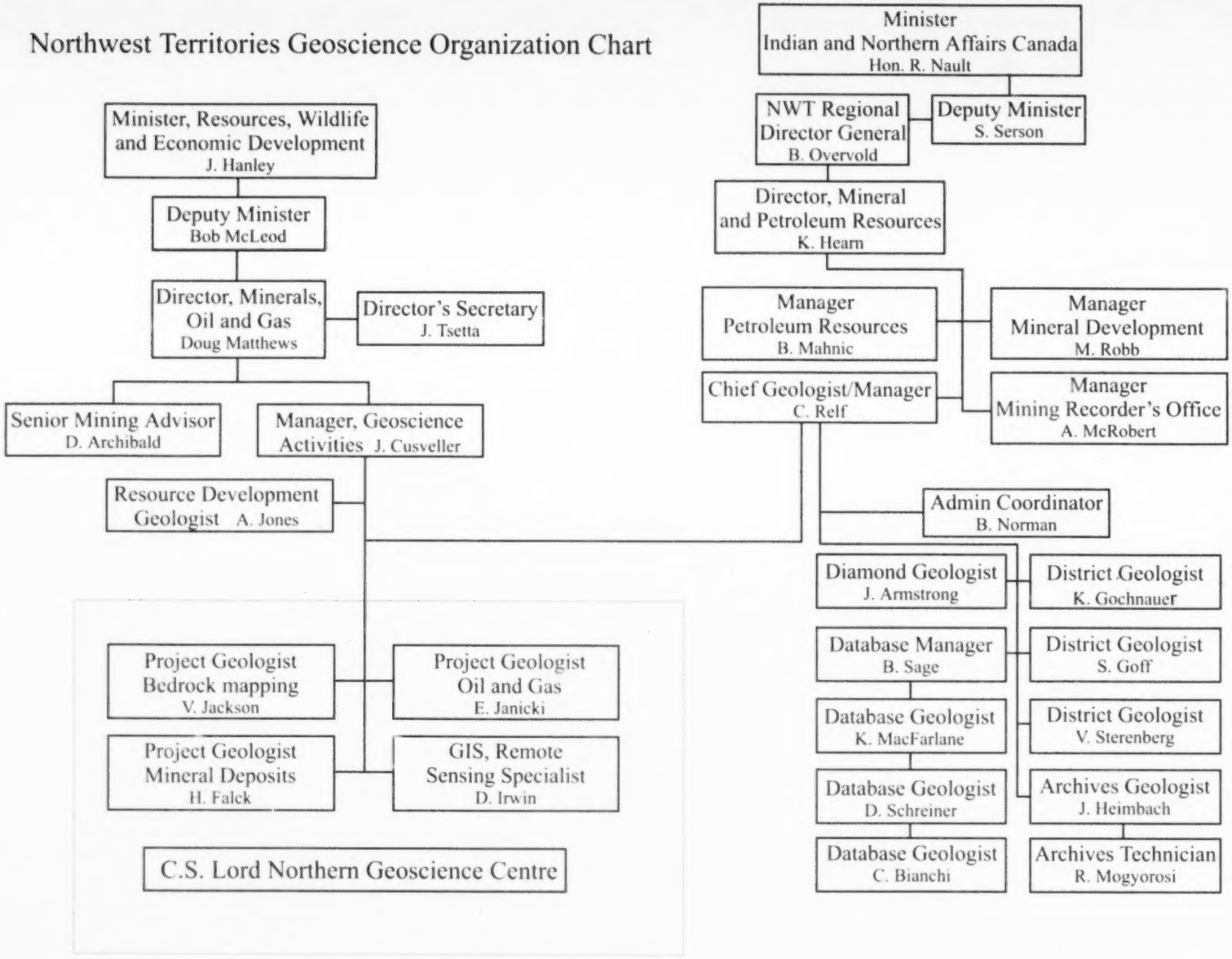
Nova Scotia Geoscience Organization Chart 2000

GEOLOGICAL SURVEY OF NEWFOUNDLAND AND LABRADOR
Organization Chart 1999-2000




YUKON MINERAL RESOURCES
ORGANIZATION CHART
MINISTER
INDIAN & NORTHERN AFFAIRS CANADA
Hon. R. Nault
DEPUTY MINISTER
S. Serafini
ASSOC. REGIONAL
DIRECTOR GENERAL
J. Guscott
YUKON REGIONAL
DIRECTOR GENERAL
T. Sewell
A/DIRECTOR
DEPARTMENT OF
MINERAL RESOURCES
R. Holmes
ADMINISTRATIVE
ASSISTANT
J. Krysh
REGIONAL MANAGER
MINING LAND USE
D. Jennings
REGIONAL MANAGER
MINING INSPECTIONS
D. Latoski
REGIONAL MANAGER
MINERAL RIGHTS
D. Weibe
CHIEF GEOLOGIST
/REGIONAL MANAGER
EXPLORATION AND
GEOLOGICAL SERVICES DIVISION
G. Abbott
OFFICE MANAGER
A. Wagner
MINFILE
GEOLOGIST
R. Dekleik
MINERALS
GEOLOGIST ½
J. Hunt
SURFICIAL
GEOLOGIST
J. Bond
STAFF GEOLOGIST
(Placer)
W. Lebarge
MINFILE
GEOLOGIST
VACANT
STAFF GEOLOGIST
(Lode)
M. Burke
PUBLICATIONS
MANAGER ½
D. Emond
JOINT FUNDING
(50% DIAND, 50% YTG)
MANAGEMENT
COMMITTEE
(Holmes, Craig,
Abercrombie, Abbott)
YUKON GEOLOGY PROGRAM
Operating funds only
SECONDMENT
G.S.C.
GEOLOGIST
C. Roots
ADMIN.
ASSISTANT
M. Shoniker
GIS
TECHNICIAN
Gord Nevin
G.I.S.
TECHNICIAN
Garry Stronghill
MINISTER OF
ECONOMIC DEVELOPMENT
Y.T.G.
Hon. P. Duncan
DEPUTY
MINISTER
A. Robertson
Assistant Deputy Minister
MINERAL RESOURCES BRANCH
L. Craig
ADMINISTRATIVE
ASSISTANT
J. Balsor
A/MANAGER
MINERAL RESOURCES BRANCH
S. Abercrombie
PROJECT
GEOLOGIST
Tammy Allen
term
PLACER
GEOLOGIST
G. Lowey
PROJECT
GEOLOGIST
L. Pigage
MINING
FACILITATOR
J. Duke
MINERAL
POLICY
ANALYST
L. Walton
SENIOR
PROJECT
GEOLOGIST
D. Murphy
PROJECT
GEOLOGIST
M. Colpron
PROJECT
GEOLOGIST
C. Hart
MINERAL
ASSESSMENT
GEOLOGIST
J. Van Randen
MINERAL
ASSESSMENT
GEOLOGIST
D. Heon
MINERAL
ASSESSMENT
GEOLOGIST
A. Fonseca
MINERAL
DEVEL.
GEOLOGIST
K. Galambos

Northwest Territories Geoscience Organization Chart



Northwest Territories Geoscience Organization Chart 2000

Nunavut Geoscience Organization Chart 2000

PROVINCIAL GEOLOGICAL SURVEY EXPENDITURES 1999-2000 FINAL & 2000-2001 PRELIMINARY

Provincial/Territorial Geological Survey Expenditures 1999-2000

Province/Territory	Survey Expenditures**	% of Canada Total	2000 Provincial Mineral Production*	Survey Expenditures as percentage of Provincial Mineral Production	Area Prov/Terr km²	Survey Expenditures $ per km²	Population 2000	Survey Expenditures per Capita
BRITISH COLUMBIA	$4,149,594	5.78%	$2,800,664,000	0.148%	944,735	$4.39	4,063,760	$1.02
ALBERTA	$2,130,840	2.97%	$50,841,338,000 +	0.004%	661,848	$3.22	2,997,236	$0.71
SASKATCHEWAN	$2,434,883	3.39%	$2,345,209,000	0.104%	651,036	$3.74	1,023,636	$2.38
MANITOBA	$3,963,400	5.52%	$1,090,226,000	0.364%	647,797	$6.12	1,147,880	$3.45
ONTARIO	$21,031,300	29.30%	$5,702,061,000	0.369%	1,076,395	$19.54	11,669,344	$1.80
QUEBEC	$24,419,600	34.02%	$3,616,469,000	0.675%	1,542,056	$15.84	7,372,448	$3.31
NEW BRUNSWICK	$2,802,055	3.90%	$790,573,000	0.354%	72,908	$38.43	756,598	$3.70
NOVA SCOTIA	$2,488,800	3.47%	$291,478,000	0.854%	55,284	$45.02	940,996	$2.64
PRINCE EDWARD ISLAND	$0	0.00%	$5,197,000	n/a	5,660	$0.00	138,928	n/a
NEWFOUNDLAND	$3,566,232	4.97%	$1,035,552,000	0.344%	405,212	$8.80	538,823	$6.62
YUKON	$2,684,912	3.74%	$55,017,000	4.880%	482,443	$5.57	30,663	$87.56
NORTHWEST TERRITORIES	$1,415,000	1.97%	$704,210,000	0.201%	1,346,106	$1.05	42,083	$33.62
NUNAVUT	$684,000	0.95%	$384,464,000	0.178%	2,093,190	$0.33	27,692	$24.70
Canadian Totals:	**$71,770,616**	**100.00%**	**$69,662,458,000**	**0.103%**	**9,984,670**	**$7.19**	**30,750,087**	**$2.33**

** Source: NRCan: Preliminary Estimate of the Mineral Production of Canada, by Province, 2000; Statistics Canada - Cat. No. 26-202-XIB*
Provincial mineral production figures include metals, non-metals, structural materials and coal.
+ Alberta figures also include natural gas, natural gas by-products and crude oil.
*** Does not include expenditures on Industry Grant Programs (e.g. Prospectors Assistance) see Table 2 for details on grants*
Expenditures column includes a total of A-base funds and other funds available to the geological surveys.
Note: *Direct comparisons between jurisdictions are difficult due to the variety of budget/program components and methods of reporting data.*

Provincial/Territorial Industry Grant Programs

1999-2000 Final

Province/Territory	Prospectors Assistance	Mineral Exploration Assistance	Total
BRITISH COLUMBIA	$500,000	n/a	$500,000
ALBERTA	n/a	n/a	n/a
SASKATCHEWAN	n/a	n/a	n/a
MANITOBA	$87,079	$1,552,351	$1,639,430
ONTARIO	$4,000,000	n/a	$4,000,000
QUEBEC	$2,306,800	$5,471,600	$7,778,400
NEW BRUNSWICK	$40,000	$350,000	$390,000
NOVA SCOTIA	$198,144	n/a	$198,144
NEWFOUNDLAND	$250,000	$1,750,000	$2,000,000
YUKON	$761,000	n/a *	$761,000
NORTHWEST TERRITORIES	$75,000	$180,000	$255,000
NUNAVUT	$0.0	$0.0	$0.0
Totals:	**$8,218,023**	**$9,303,951**	**$17,521,974**

* *Yukon Target Evaulations*

Provincial Geological Survey Expenditures

2000-2001 Preliminary Estimates

Province/Territory	Survey Expenditures	% of Total	Industry Grant Programs	Totals
BRITISH COLUMBIA	$3,995,140	5.90%	$500,000	$4,495,140
ALBERTA	$4,601,102	6.80%	$0	$4,601,102
SASKATCHEWAN	$2,500,000	3.69%	$0	$2,500,000
MANITOBA	$4,439,900	6.56%	$2,875,000	$7,314,900
ONTARIO	$21,382,000	31.59%	$0	$21,382,000
QUEBEC	$16,494,700	24.37%	$13,076,300	$29,571,000
NEW BRUNSWICK	$2,291,600	3.39%	$440,000	$2,731,600
NOVA SCOTIA	$1,989,400	2.94%	$190,000	$2,179,400
NEWFOUNDLAND	$3,392,200	5.01%	$2,150,000	$5,542,200
YUKON	$3,358,250	4.96%	$756,000	$4,114,250
NORTHWEST TERRITORIES	$2,538,000	3.75%	$308,000	$2,846,000
NUNAVUT	$700,000	1.03%	$0	$700,000
Canadian Total:	**$67,682,292**	**100.00%**	**$20,295,300**	**$87,977,592**

Province: British Columbia 1999-2000

	Funding Agency	Number of Projects	Permanent Positions	Casual Positions	Salaries	Operational	Total $
Mineral Activities							
Bedrock geological surveys	GSB	7	9		$733,896	$238,500	$972,396
Geochemical surveys	GSB	2	2.5		$171,403	$68,735	$240,138
Surficial geology surveys	GSB	4	3.4	1	$279,291	$53,000	$332,291
Mineral deposit studies	GSB	5	5		$476,843	$124,000	$600,843
Mineral inventory compilations	GSB		5		$190,384	$20,000	$210,384
Industrial mineral studies	GSB	1	1.4		$111,233	$25,000	$136,233
Vancouver Mineral Development Office	GSB		3		$193,363	$47,000	$240,363
Regional Geologists	Mines Br.		4		$309,043	$50,767	$359,810
Sub total		**19**	**29.3**	**1**	**$2,156,413**	**$576,235**	**$2,732,648**
Energy Activities							
Coal	GSB	1	1		$81,249	$20,000	$101,249
Sub total		**1**	**1**	**0**	**$81,249**	**$20,000**	**$101,249**
Other Activities							
Terrain Map Library	FRBC		2		$56,832	$93,168	$150,000
Mineral Resource Assesment	CRII		1		$120,500	$158,500	$279,000
Assaying Costs	GSB		0.5		$37,918	$14,370	$52,288
Admin/Management	GSB		9.85		$630,872	$387,075	$1,017,947
Sub total		**0**	**10.35**	**0**	**$668,790**	**$401,445**	**$1,070,235**
Miscellaneous							
Publications	GSB		1.75		$108,669	$14,000	$122,669
Information/assessment files	GSB		1.25		$80,293	$10,000	$90,293
Research Grants	GSB					$32,500	$32,500
Sub total		**0**	**3**	**0**	**$188,962**	**$56,500**	**$245,462**
Total Mineral Survey Activities		**20**	**43.65**	**1**	**$3,095,414**	**$1,054,180**	**$4,149,594**
(GSB Base Budget)							

Funding Agency Abbreviations:
**GSB - Geological Survey Branch,CRII - Corporate Resource Inventory Initiative; Mines Br. - Mines Branch, FRBC - Forest Renewal B.C.*

Province: Alberta 1999 - 2000

	Agency	Funding	Projects	Person Years Perm.	Person Years Casual	Salaries ($) Perm.	Salaries ($) Casual	Operating Expenditures	Total ($)
Mineral Activities									
Geochemical Surveys	EUB	EUB	1	2.11		$72,172		$42,968	$115,140
Bedrock Geology	EUB	EUB	2	1.4		$20,658		$179,481	$200,139
Mineral Investigations (Field)	EUB	1	2	1.86		$49,906		$124,609	$174,515
Industrial Minerals	EUB	EUB	1	3.55	0.10	$130,961	$1,542	$39,511	$172,014
Core Repositories	EUB	EUB	1	0.11		$5,946		$3,857	$9,803
Energy Activities									$0
Oil, Gas, and Coal	EUB	1	3	4.76		$239,168		$84,133	$323,301
Other Activities									$0
Hydrogeology	EUB	1	1	5.76	0.10	$86,796	$2,673	$45,578	$135,047
Geoscience Information System	EUB	EUB	1	1.98		$104,400		$59,385	$163,785
Chief's Office / Administration	EUB	EUB	3	7.03		$171,584		$214,648	$386,232
Laboratories	EUB	EUB	1	0.25		$13,786		$3,857	$17,643
Miscellaneous									$0
Library	EUB	EUB	1	0.81		$33,012		$39,219	$72,231
Publication / Data Sales	EUB	EUB	5	2.08		$109,262		$147,126	$256,388
Other	EUB	EUB	2	1.56		$100,136		$4,465	$104,601
Totals				**33.26**	**0.20**	**$1,137,788**	**$4,215**	**$988,837**	**$2,130,840**

1 = EUB / WEPA

Province: SASKATCHEWAN 1999-2000

	# Projects	Positions #py's Permanent	Positions #py's Non-permanent	Salaries Permanent	Salaries Non-permanent	Operational $	Total $
Mineral Activities							
Bedrock Geology Survey	8	4.2	3	$292,335	$138,046	$64,343	$594,724
Mineral Investigations	2	1.25	0	$71,093	$8,000	$13,866	$92,959
Mineral Deposit Invertory	1	1	0.3	$54,429	$0	$0	$54,429
Industrial Mineral Studies	1	1	0.3	$59,439	$6,815	$9,392	$75,646
District Geologists	n/a	2	0	$99,189	$0	$0	$99,189
Core Depositories	1	0	0.3	$0	$7,682	$11,532	$19,214
Mineral Resource Assessment	1	1.25	0.75	$67,155	$33,635	$5,522	$106,312
Energy Activities							
Oil/gas	n/a	7.4	1.7	$272,745	$51,558	$5,523	$329,826
Core Depositories	1	6	1.4	$175,600	$29,700	$30,000	$235,300
Subsurface analysis	3	4.8	2	$254,250	$71,200	$18,000	$343,450
Other Activities							
Chief's Office/Administration	n/a	2	0	$98,148	$0	$70,559	$168,707
Miscellaneous							
Publications	n/a	3	0	$131,004	$0	$38,659	$169,663
Information/Assessment Files	n/a	0	0.8	$0	$28,371	$3,536	$31,907
Other - GIS/Computerization	n/a	1	1	$63,366	$33,382	$16,809	$113,557
Grand Total	**18**	**34.9**	**11.55**	**$1,575,387**	**$375,007**	**$370,932**	**$2,434,883**

Province: MANITOBA 1999-2000

PROGRAMS	SURVEY RESEARCH AGENCY	FUNDING AGENCY	NO. OF PROJECTS/ FACILITIES	PERMANENT SMY	CASUAL/ TERM SMY	SALARIES PERMANENT $	SALARIES CASUAL $	OPERATING EXPENDITURES $	TOTAL
MINERAL ACTIVITIES									
Bedrock Geology Surveys	MGS	MAN	33	12:00	2:02	$741,200	$76,300	$188,000	$1,005,500
Geochemical Surveys	MGS	MAN	4	2:00	0:31	$147,000	$15,400	$257,500	$419,900
Surficial Geology Surveys	MGS	MAN	5	2:00	1:14	$120,300	$20,800	$17,860	$158,900
Geophysical Surveys	MGS	MAN	2	1:00	-	$67,300	-	$3,200	$70,500
Mineral Investigations (Field)	MGS	MAN	10	2:00	0:04	$113,900	$1,800	$36,900	$152,600
Mineral Deposit Analysis/Inventory	MGS	MAN	2	2:00	-	$116,500	-	n/a	$116,500
Industrial Minerals	MGS	MAN	4	1:00	0:13	$61,400	$4,600	$4,400	$70,400
District Geologists	MGS	MAN	4	4:26	-	$231,600	-	$29,500	$261,100
Core Repositories	MGS	MAN	6	0:00	-	n/a	n/a	$6,800	$6,800
ENERGY ACTIVITIES									
Coal/Peat	-	-	-	-	-	-	-	-	-
Oil & Gas	-	-	-	-	-	-	-	-	-
Core Repositories	-	-	-	-	-	-	-	-	-
Subsurface Analysis	-	-	-	-	-	-	-	-	-
OTHER ACTIVITIES									
Environment/Land Use	MGS	MAN	1	-	-	-	-	n/a	$0
Hydrology	MGS	MAN	-	-	-	-	-	-	-
Laboratories	MGS	MAN	3	4:00	0:05	$149,700	$2,300	$24,800	$176,800
Miscellaneous Activities	MGS	MAN	7	8:00	0:00	$412,500	-	$174,200	$586,700
Chiefs Office/Administration	MGS	MAN	11	7:00	0:21	$296,800	$4,300	$636,600	$937,700
MISCELLANEOUS DETAILS									
Library	-	-	-	-	-	-	-	-	-
Publications	-	-	-	-	-	-	-	-	-
Prospectors Assistance	-	-	-	-	-	-	-	-	-
Information/Assessment Files	-	-	-	-	-	-	-	-	-
Research Grants	-	-	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	-	-	-
TOTALS	-	-	**92**	**45:26**	**4:38**	**$2,458,200**	**$125,500**	**$1,379,700**	**$3,963,400**

MGS - Manitoba Geological Services

Province: ONTARIO 1999-2000

	Funding Agency	Number of Projects or Facilities	Staff Permanent (person/yrs)	Staff Contract (person/yrs)	Salaries	Operating Expenditures *(incl. Benefits)*	Totals
Mineral Activities							
Bedrock Geology Surveys	MNDM	11	20.0	7.5	$1,463,000	$876,000	$2,339,000
Geochemical Surveys	MNDM	1	2.0	3.0	258,000	191,000	$449,000
Surficial Geology Surveys	MNDM	3	3.0	2.0	272,400	101,000	$373,400
Mineral Investigations (field)	MNDM	5	3.5	2.0	263,600	79,400	$343,000
Mineral Deposit Analysis and/or Inventory	MNDM	1	1.0		63,100	26,000	$89,100
Industrial Minerals	MNDM	4	4.0	1.5	271,000	166,800	$437,800
Resident & District Geologists	MNDM	10	43.5		1,785,900	784,200	$2,570,100
Core Repositories	MNDM	5	2.0		95,400	46,500	$141,900
Geophysical Surveys	MNDM	1	1.0		63,100	73,000	$136,100
Other Activities							
Geoscience Assessment	MNDM		5.0		246,500	79,400	$325,900
Environment/Land Use	MNDM		1.0		62,200	28,400	$90,600
Laboratories	MNDM		17.0	8.0	1,100,000	749,000	$1,849,000
Miscellaneous Details							
Library	MNDM		1.0		35,400	26,000	$61,400
Publications	MNDM		5.0		227,500	249,500	$477,000
Data Services	MNDM		8.0		472,000	876,000	$1,348,000
Totals			**117.0**	**24.0**	**$6,679,100**	**$4,352,200**	**$11,031,300**
Industry Grant Programs							
Prospector's Assistance*	MNDM/OPAP					$4,000,000	$4,000,000
Additional Initiatives							
Ontario Treasure Hunt	MNDM					$10,000,000	$10,000,000

*Program administered by Mines Group

MNDM - Ministry of Northern Development & Mines

OPAP - Ontario Prospector's Assistance Program

Province : Québec 1999-2000

Programmes	Financement	Nb de projets	Employés (équivalent à temps complet) Permanents	Employés (équivalent à temps complet) Occasionnels	Employés (équivalent à temps complet) Contrat	Salaires $ Permanents	Salaires $ Occasionnels	Salaires $ Contrat	Dépenses d'opération $	Total $
Activités géominières										
Cartographie géologique	MRN	16	27.67	48.09		$1,130,431	$1,964,669		$5,080,600	$8,175,700
Levés/études géochimiques	MRN	1	0.10			$5,000				$5,000
Levés/études géophysiques	MRN									$0
Levés/études géologie de surface	MRN									$0
Recherche en métallogénie (terrain) et gîtologie	MRN MRN	9	10.98	7.53		$551,248	$413,652		$915,400	$1,880,300 $0
Évaluation de potentiel minéral	MRN	4	0.90	0.00		$50,500			$3,500	$54,000
Minéraux industriels	MRN	5	1.85	0.91		$108,500	$23,300		$121,500	$253,300
Bureaux régionaux	MRN		21.11	5.72		$873,827	$236,773		$557,200	$1,667,800
Promotion du potentiel minéral	MRN		7.37	1.66		$352,503	$79,397		$296,200	$728,100
Compilations géominières	MRN		3.17	10.13		$124,226	$396,974		$45,200	$566,400
Autres activités										
Administration/bureau du géologue en chef	MRN		22.58	8.06		$993,181	$354,519		$1,594,900	$2,942,600 $0
Divers			6.12	0.03		$257,637	$1,263	$8,500	$100,600	$368,000
Promotion et marketing Publications Autres (SIGÉOM-GIS)	MRN									
Sous total		35	101.85	82.13		$4,447,053	$3,470,547	$8,500	$8,715,100	$16,641,200
Assistance financière à l'exploration minière	MRN	395	3.00	1.80		$177,850	$66,050		$7,534,500	$7,778,400
Grand total		**430**	**104.85**	**83.93**		**$4,624,903**	**$3,536,597**	**$8,500**	**$16,249,600**	**$24,419,600**

MRN = Ministère des Ressources naturelles

Province: NEW BRUNSWICK 1999-2000

	No. of Projects	Staff			Salaries	Operating	Total
		Perm.	Casual	Contract			
Geological Surveys Branch							
Bedrock Geology	7	4.0	0.5	2.0	$308,400 [1]	$82,100	$390,500
Surficial Geology and Till Geochemistry	4	5.0	0.3		$271,200	$167,800 [2]	$439,000
Mineral Deposits	4	2.5	0.5	1.0	$177,600	$58,650	$236,250
GIS and Digital Technology	4	3.5			$135,700	$32,950	$168,650
Regional Geologists	2	7.0	0.3		$311,000	$75,500	$386,500
Drill Core	3	1.0			$56,100	$33,900 [3]	$90,000
Editorial (Communications Branch)	1	1.0			$55,955	$5,900	$61,855
Director's Office	1	1.0	0.3		$68,600	$7,800	$76,400
Geophysics (Airborne)	1					$400,000 [4]	$400,000
Industrial Minerals	3	3.0			$175,800	$25,400	$201,200
Publications Education	5	5.0			$194,000	$78,600	$272,600
Oil, Gas, Oil Shale	1	1.0	0.2		$66,400	$12,700	$79,100
Total	**36**	**34.0**	**2.1**	**3.0**	**$1,820,755**	**$981,300**	**$2,802,055**

[1] Includes $25,000 funding from the NATMAP Program

[2] Includes $100,000 funding from the N.B. Regional Development Corporation

[3] Includes $25,000 funding from the Department Capital Budget

[4] Funding from the N.B. Regional Development Corporation

Province: NOVA SCOTIA 1999-2000

	Survey Research Agency	Funding Agency	No. of Projects or Facilities	Employees* Permanent	Employees* Casual	Operating* Expenditures	Salaries*	Totals*
Mineral Activities								
Bedrock Geology Surveys	MERD	NSDNR	4	5.0	1.6	$38,500	$282,960	$321,460
Geochemical Surveys	MERD	NSDNR	2	1.5	0.4	$14,000	$95,275	$109,275
Surficial Surveys	MERD	NSDNR	1	2.5	0.4	$20,000	$148,155	$168,155
Geophysical Surveys								
Mineral Investigations (Field)	MERD	NSDNR	2	2.5	0.4	$35,100	$151,445	$186,545
Mineral Deposit Analysis/Inventory	MERD	NSDNR	2	2.5	0.4	$27,100	$138,910	$166,010
Industrial Minerals	MERD	NSDNR	2	2.5	0.4	$20,000	$138,910	$158,910
District Geologists	RSB	NSDNR						
Core Repositories	MERD	NSDNR	1	6.0	0.4	$32,600	$208,015	$240,615
Energy Activities								
Coal/Peat	MERD	NSDNR	2	2.5	0.4	$22,100	$153,155	$175,255
Oil and Gas	PD							
Core Repositories	PD							
Subsurface Analysis	PD							
Other Activities								
Environmental / Land Use	MERD	NSDNR	2	2.5		$5,000	$130,715	$135,715
Hydrology	DOE							
Laboratories								
Misc Activities - Mineral Promotion	MERD	NSDNR	n/a	1.0		$20,000	$67,520	$87,520
Chief Geologist's Office/Administration	MERD	NSDNR	n/a	2.0		$43,100	$116,055	$159,155
Miscellaneous Details								
Library	PS	NSDNR	n/a					
Publications	MERD	NSDNR	n/a	2.5		$41,000	$105,630	$146,630
Public Awareness/Prospectors Training	MERD	NSDNR	n/a	2.0	0.4	$10,000	$138,520	$148,520
Information/Assessment Files	MERD	NSDNR	n/a	1.5		$5,000	$71,920	$76,920
Research Grants								
Informaton Technology	MERD	NSDNR	n/a	3.5	1.6	$37,500	$170,615	$208,115
Totals				**40.0**	**6.4**	**$371,000**	**$2,117,800**	**$2,488,800**

* = FTEs and budget data provided for MERD only, salary data include permanent and casual employees

MERD = Mineral and Energy Resources Division
RSB = Regional Services Branch
PD = Petroleum Directorate
PS = Planning Secretariat
DOE = Department of Environment

Province: NEWFOUNDLAND & LABRADOR 1999-2000

	Survey Research Agency	Funding Agency	No. of Projects/ Facilities	Permanent[1] SMY	Casual SMY	Salaries Permanent $	Salaries Contract[1] $	Salaries Casual $	Operating Expenditures $	Totals $
Mineral Activities										
Bedrock geology surveys	GSNL	NDME	10	10	4	$543,226		$39,085	$396,800	$979,111
Geochemical surveys	GSNL	NDME	4	3	2.5	$154,882		$24,297	$97,556	$276,735
Surficial geology surveys	GSNL	NDME	2	2	2	$107,339		$28,936	$54,013	$190,288
Geophysical surveys	GSNL	NDME	1	1		$49,268			$1,789	$51,057
Mineral investigations (field)	GSNL	NDME	5	4	1	$220,777		$22,384	$103,126	$346,287
Mineral deposit analysis &/or inventory	GSNL	NDME	1	4		$85,045	$39,376		$17,373	$141,794
Industrial minerals	GSNL	NDME	2	2		$98,536			$5,041	$103,577
District geologists										
Core repositories	MLD	NDME	1	2	0.5	$101,718		$5,730	$47,979	$155,427
Energy Activities										
Coal/Peat										
Oil & Gas	EB	NDME	1	21		$816,158	$303,200		$381,100	$1,500,458
Core Repositories										
Subsurface Analysis										
Other Activities										
Environment/Land Use	MLD	NDME	1	3		$94,540			$17,143	$111,683
Hydrology										
Laboratories	GSNL	NDME	1	4		$146,359			$55,183	$201,542
Miscellaneous Activities										
Director's Office/Admin.	GSNL	NDME	2	8	1	$269,801	$36,812	$8,406	$174,771	$489,790
Miscellaneous										
Library	GSNL	NDME	1	*3	0.5	$24,634		$3,594	$15,513	$43,741
Publications/Cartography	GSNL	NDME	3	8	1	$277,964	$22,142		$110,572	$410,678
Information/Assessment Files	GSNL	NDME	1	3		$182,937			$28,095	$211,032
Research Grants										
Information Technology	GSNL	NDME	1						$120,600	$120,600
TOTALS			**37**	**78**	**12.5**	**$3,173,184**	**$401,530**	**$132,432**	**$1,626,654**	**$5,333,800**

Notes: *GSNL - Geological Survey of Newfoundland and Labrador*
MLD - Mineral Lands Division; EB - Energy Branch; MB - Mines Branch
NDME - Newfoundland Department of Mines and Energy
1 - includes long-term temporary staff
** - includes one employee sponsored by Opening Doors Program*

TOTAL GEOLOGICAL SURVEY ACTIVITIES 1999-2000 (GSNL).... $3,566,232

TOTAL GEOLOGICAL SURVEY ACTIVITIES 2000-2001 (GSNL).... $3,392,200

Territory: YUKON 1999 -2000

	Research Agency	Funding Agency	Projects	Positions		Operating Expenditures
				Permanent	Casual	
Mineral Activities						
Bedrock Geological Surveys	YTG	INA/YTG	4	3	2.5	$540,300
	GSC	INA/YTG/GSC	1	1	0	$6,000
Mineral Deposit Studies	INA	INA/YTG	1	1	0.25	$60,718
	YTG	INA/YTG	1	1	0.5	$168,600
Surficial Geology	YTG	INA/YTG	1	0	0	$123,900
	YTG	INA/YTG	1	0	0	$20,500
	INA	INA	1	1	1	$94,199
	INA	INA/YTG	1	1	0.25	$65,497
	GSC	INA/YTG/GSC	1	0	0	$5,750
	YTG	INA/YTG	1	0	0	$17,500
Mineral Resource Assessments	YTG	YTG	3	1	2.75	$320,000
Mineral Deposit Inventory	INA	INA	1	0.75	0.25	$64,629
	YTG	INA/YTG	1	0	0.75	$32,500
	YTG	INA/YTG	1			$21,200
District Geologists	INA	INA	1	1	0	$71,815
Core Repositories	INA	INA	1	0.25	0.25	$50,000
Energy Activities						
Oil & Gas Resource Assessments	YTG/NEB	YTG	2	0	0	$200,000
Other Activities						
Chief Geologist/Administration	YTG	INA/YTG	2	1	0	$216,300
	YTG	YTG	1	1	0	$85,000
Ch.Geol/Admin/Travel/Training	INA	INA	1	1.5	0	$232,763
Miscellaneous						
Library	INA	INA	1	0	0	$40,000
Cartography/Publications	INA	INA	1	0.5	0.25	$60,941
	YTG	INA/YTG	1	1	0	$74,300
	YTG	INA/YTG	1	1	0	$72,200
Assessment Files	INA	INA	1	0.25	0	$5,000
Research (thesis support)	YTG	INA/YTG	5	0	0	$35,300
Total			**37.0**	**12.3**	**2.5**	**$2,684,912**

Territory: NORTHWEST TERRITORY 1999-2000

	1999 to 2000 (DIAND and GNWT)	2000 to 2001 (DIAND and GNWT)	1999 to 2000 salary	2000 to 2001 salary
Mineral Activities				
Bedrock geology surveys	$306,000	$300,000	$210,000	$180,000
Geochemical surveys	n/a	n/a	n/a	n/a
Surficial geology surveys	n/a	n/a	n/a	n/a
Geophysical surveys	n/a	n/a	n/a	n/a
Mineral investigations (field)	$300,000	$310,000	$140,000	$170,000
Mineral deposit analysis/inventory	$45,000	$120,000	$400,000	$400,000
Industrial minerals	n/a	n/a	n/a	n/a
District geologists	$40,000	$30,000	$250,000	$250,000
Core repositories	$4,000	$2,000	n/a	n/a
Energy Activities				
Coal/Peat	n/a	n/a	n/a	n/a
Oil & Gas	$24,000	$40,000	$70,000	$105,000
Core Repositories	n/a	n/a	n/a	n/a
Subsurface analysis	n/a	n/a	n/a	n/a
Other Activities				
Environmental/Land use	$5,000	$0	$18,000	$0
Hydrology	n/a	n/a	n/a	n/a
Laboratories	n/a	n/a	n/a	n/a
Miscellaneous Activities		$30,000	n/a	n/a
Chief Geologists Office/Admin	$120,000	$130,000	$130,000	$130,000
Miscellaneous Details				
Library	$4,000	$3,000	n/a	n/a
Publications	$15,000	$30,000	$50,000	$50,000
Information/Assessment files	$8,000	$13,000	$60,000	$60,000
Research Grants	n/a	n/a	n/a	n/a
Other	$115,000	$115,000	$70,000	$70,000
Totals	**$986,000**	**$1,123,000**	**$1,398,000**	**$1,415,000**

Territory: NUNAVUT 1999-2000

	Funding Agency	Number of Projects	Positions (Term)	Salaries	Operating	Total
Mineral Activities						
Bedrock geological surveys	C-NGO	2	1.0	$64,000	$200,000	$264,000
Surficial geological surveys	C-NGO	2	0.0	$0	$70,000	$70,000
Mineral investigations	C-NGO	0	0.0	$0	$0	$0
GIS and digital technology	C-NGO	3	0.6	$30,000	$40,000	$70,000
Mineral deposit inventory	DIAND (NWT)	NORMIN				
Industrial Mineral studies	n/a	n/a	0.0	$0	$0	$0
District Geologists	DIAND (NWT)	n/a	1.0	$60,000	$30,000	$90,000
Core depositories	n/a	0	0.0	$0	$0	$0
Energy Activities						
Oil/gas	n/a	n/a	n/a	$0	$0	$0
Core depositories	n/a	n/a	n/a	$0	$0	$0
Subsurface analysis	n/a	n/a	n/a	$0	$0	$0
Other Activities						
Outreach and Awareness	C-NGO	n/a				$0
Library	C-NGO	n/a			$20,000	$20,000
Administration	C-NGO	n/a	0.5		$50,000	$50,000
Relocation costs	C-NGO	n/a	n/a		$120,000	$120,000
Total			**3.1**	**$154,000**	**$530,000**	**$684,000**

Geological Highlights 2000

British Columbia Program Highlights 2000

Overview

Base funding allocation for the British Columbia Geological Survey (GSB) was $4.0 million in 2000-2001, similar to last year. The survey program serves government objectives in areas of economic development and land and resource management. The base budget was supplemented by $246 000 from other government agencies for inventory projects in land use planning.

The Geological Survey of Canada's (GSC) new 3-year, $15 million Targeted Geoscience Initiative (TGI) injected a much needed boost by the Federal agency to surveying activities in BC. The Province partnered with the GSC to provide $70 000 towards a regional geochemical survey of the Dease Lake map sheet in 2000.

Economic Development Program

Most of the Survey's field programs were concentrated on attracting mineral exploration investment to under-explored frontier regions or areas with established mining infrastructure. There were three new field projects in the most active exploration area in the province in 2000, the Cariboo Mining Camp. The GSB also completed three projects as part of the Ancient Pacific Margin NATMAP program, a joint venture with the Geological Survey of Canada, universities and industry. Other projects addressed a variety of aspects of provincial geology and mineral deposits, including new regional geochemical stream sediment data for the Dease Lake sheet, PGEs, intrusion-related gold potential, the Ecstall volcanogenic massive sulphide belt, coal and industrial minerals.

Wells-Barkerville Area

- ✔ The GSB initiated a program led by Gerry Ray to investigate the controls of gold mineralization in the Barkerville Camp with an emphasis on the newly discovered Bonanza Ledge Zone of International Wayside Gold Mines Ltd. This is an exciting new gold discovery located 3 kilometres southeast of the former Cariboo Gold Quartz mine in Wells.
- ✔ Near Cariboo Lake, Fil Ferri started a 1:50 000-scale mapping program to examine Barkerville Terrane rocks belonging to the Snowshoe Group which host the new Frank Creek and Ace massive sulphide showings. The primary objectives of this project are to determine the geologic setting of these occurrences together with the nature and relationships of nearby volcanics.
- ✔ The third Survey project in the Cariboo Camp consisted of till surveys designed to assist exploration in the many parts of the area with thick overburden and limited outcrop. Peter Bobrowsky completed a till orientation survey in the vicinity of the Ace property to model geochemical signatures over massive sulphide deposits. He also completed a 1:50 000-scale regional till survey north and west of Wells covering mainly Slide Mountain and Barkerville terranes to provide background and anomalous geochemistry data for this highly prospective region.

Ancient Pacific Margin NATMAP Project

- ✔ Government geologists, university researchers and industry geologists were all active along the belt of pericratonic rocks that form the Ancient Pacific Margin of North America.
- ✔ In the extreme northern part of the province, just east of Teslin Lake, JoAnne Nelson and Mitch Mihalynuk completed their mapping projects to examine the Dorsey Terrane and Big Salmon Complex respectively. Their work demonstrates that favourable Yukon-Tanana stratigraphy, with excellent potential for volcanogenic massive sulphides, extends from the Yukon into British Columbia. Mapping delineated an extensive crinkle chert unit with piedmontite and iron formation and new exposures of felsic volcanics.
- ✔ In the Revelstoke region, Trygve Hoy was studying massive sulphide Broken Hill-type and Sedex deposits in the highly deformed and metamorphosed

Monashee cover sequence. This area has experienced renewed interest in these deposit types with the discovery of the Navan/Vista near Avola, and acquisition of Ruddock Creek deposit by Doublestar Resources.

Regional Geochemical Surveys

✔ New INAA data including gold analyses for 2727 sediment samples collected from surveys conducted in the late 1970s in the Atlin (NTS 104N), Jennings River (NTS 104O) and McDame (NTS 104P) map sheets were published in June 2000. The data clearly highlighted existing mining camps and identified many other precious and base metal anomalies.

PGE Environments

✔ Graham Nixon started a project to study platinum group element (PGE) environments in the province. His initial focus is palladium-rich environments associated with alkalic rocks. In the first year, his efforts were focused on the Whiterocks Mountain intrusive complex and the associated Dobbin Cu-PGE mineral occurrence. Currently studies are ongoing to examine the mineralization, petrology, mineral compositions and chemistry of the various samples collected this summer. As well, soil samples were collected to be analyzed for PGE and other trace elements using an ultra-low level leaching technique developed by the GSC.

✔ Two PGE GeoFiles are posted to the Survey web site, GF2000-2 is a map showing the distribution of PGE occurrences in British Columbia and GF2000-5 describes the different types of PGE deposits.

Ecstall Belt

✔ A mapping and mineral deposit project is ongoing in the Ecstall Belt located within the Coast Plutonic Complex, 70 kilometers southeast of Prince Rupert. Dani Alldrick is delineating the prospective felsic volcanic facies and documenting the features of the 25 mineral prospects in the belt. The northern portion of the belt has been mapped.

Other Field Projects

✔ The intrusion-related gold reconnaissance project led by Jim Logan continues to uncover examples of plutonic-related mineralization associated with the mid-Cretaceous Bayonne suite of intrusions in southern British Columbia. The objective is to identify areas in the southern part of the province with potential for gold deposits related to granitic intrusions, such as Pogo and Fort Knox.

✔ A new project was started on the Bonnaparte Map Sheet, just northwest of Little Fort on the North Thompson River. Paul Schiarizza's mapping has produced major revisions to the existing geological maps, including identification of an extensive mafic intrusive complex that is related to many of the mineral occurrences in the project area. Early results suggest that there are not any Jurassic stratified rocks in the map area as previously reported. As well, assay results for 7 samples show anomalous base and/or precious metal values in areas where mineralization had not been previously reported.

✔ Surficial geology and till geochemical case studies at the Huckleberry Mine and Chisholm Lake porphyry prospect by Vic Levson will provide a better understanding by modelling dispersal patterns of mineralization in glacial till over the deposits. These results will assist in interpreting complex ice-flow models and geochemical till data from the region.

✔ A project led by Don MacIntyre set out to test the potential for Eskay Creek-type VMS deposits along the trend of the Skeena Arch. The principal focus was mid-Cretaceous volcanics of the Rocky Ridge Formation of the Skeena Group, previously assumed to comprise only mafic flows. Preliminary field results identify Rocky Ridge volcanics at Fort Babine, Suskwa River, Mt.Cronin, Beament, Mt. Ney and Troitsa Lake. While geochronological dating is required to confirm these interpretations; the field results show felsic volcanics and related mineralization are more common than previously thought.

✔ A short 20 day field project by Andrew Legun will produce a new geology map for the Sustut Copper area. Doublestar Resources Ltd. was actively drilling on the Sustut property to create an improved reserve estimate based on 50 foot centres.

Coal

Interest in coal bed methane (CBM) interest was high in 2000 and during the year the Province sold over $20 million of CBM exploration rights. As this resource is derived from coal seams, GSB staff have been active in providing clients and Ministry executive with information and advice. Three new GeoFiles have been released in response to this demand. CBM studies by Barry Ryan concerning cleating in coal and adsorption characteristics of Gething Formation coals are underway.

Industrial Minerals

George Simandl focused his field efforts on new industrial mineral occurrences and existing operations in the southeast B.C., Kamloops and Prince George areas. This work is being used intensively in preparation for the *37th Forum on the Geology of Industrial Minerals* to be held in Victoria in May, 2001.

Resource Management Program

The Branch received $246 000 from the Government's Corporate Resource Inventory Initiative (CRII) to complete an aggregate inventory in the Sea to Sky Highway corridor and to undertake detailed mineral potential studies of the North Coast in support of a new Land and Resource Management Planning. Mineral occurrences were examined and key areas were covered with regional geochemical sampling surveys.

A portfolio of earthquake hazards maps for the Capital Regional District were released in May 2000.The maps show areas susceptible to amplification of ground motion, liquefaction and earthquake-induced slope instability.

Prospector Assistance

The Prospector Assistance program was funded at $500 000 in 2000. Fifty one prospectors received grants worth more than $430 000 and spent more than 2500 prospecting days in the field.

MapPlace

Development of the MapPlace web site continues unabated despite changes in personnel and administrative responsibilities. The site continues to be successful with an average of over 1100 hits per day. Improvements to the site include rewriting and updating many of the web pages; a self guided tour of MapPlace and a new BC Geology map including a Java version for Mac users. New data layers have been added for regional aeromagnetics, coal boreholes, and a digital elevation model

Minfile/ARIS

Maintenance of the MINFILE database includes 16 new occurrences and 276 updates. Compilation for the North Coast area continues. The MINFILE web pages have been updated with enhanced searches and extracts introduced. The MINFILE CD-ROM has proven a success with over a 100 copies distributed. Assessment Reports are now being routinely scanned and posted to the website.

New Publication Series

In 2000 the Branch initiated a new publication series available exclusively over the Internet called GeoFiles. These digital products are designed to get information out quickly to clients; they are not necessarily subject to the same editorial standards as hardcopy publications. They provide a vehicle to make information available to the public which may not have justified a hardcopy publication.

Staffing News

There have been a number of changes on the staffing front. Ward Kilby, the author of our award winning MapPlace, resigned in June to take a position in industry. Larry Jones has taken over responsibility for managing the MapPlace in addition to retaining overall responsibility for MINFILE. Don MacIntyre has taken over responsibility for the Mineral Potential Database; he is also directing the BCGS new initiatives and standards for digital map production.

Two GSB staff were recognized nationally and internationally in 2000 for their work. Peter Bobrowsky was elected to the position of Vice President of the International Union of Geological Sciences during the 31st International Geological Congress in Rio de Janeiro, Brazil this past August. The IUGS is one of the world's largest non-governmental scientific organizations with more than 110 national members . It promotes and supports the study of geological problems of world-wide significance.

Tom Schroeter was this year's recipient of the prestigious C.J. Westerman Memorial Award - APEGBC's highest honour for a geoscientist. This award is for a professional geoscientist who combines a solid professional career with outstanding service and dedication to advancing public recognition of professional geoscience in BC. Earlier in the year Tom was awarded one the CIM's major awards - the Julian Boldy Memorial Award in recognition of his service to the CIM for editing of the landmark Special Volume 46, *Porphyry Deposits of the Western Cordillera of North America*.

Alberta Program Highlights 2000

Highlights

The Alberta Geological Survey (AGS) enjoyed significant growth in budget and staff during 2000. Projected total budget for the year will be more that $4.6 million (includes all sources of funding) and total complement by fiscal year end will be 48 (although actual FTEs for the year will be much below that level).

Current interest in certain resources by industry and government drive the major technical focus and direction of AGS work. There was a renewed interest in unconventional gas particularly coalbed methane (CBM) and in the geologic storage, utilization and sequestration of greenhouse gases (mainly CO_2) and continued interest in diamonds, metallic and industrial minerals.

A draft Minerals Strategy for Alberta was developed in 1999 in recognition of the potential of new metallic (including diamonds) and an expanded industrial minerals industry in Alberta and accounts for much of AGS's recent growth. Under the strategy, the government accepted additional geological studies as a first step in support of an Alberta minerals industry. The Alberta Energy and Utilities Board (EUB) responded on behalf of the Ministry of Resource Development by providing an additional provided $1.5 million dollars for geological mineral work. As part of this expanded minerals program, three newly hired geologists, including a senior geologist to act as Minerals Section Leader, were added to AGS staff during calendar year 2000. Four more geologists, plus a geological database-specialist, and a geological technologist are planned to be added during the last quarter of the 2000-2001 fiscal year.

During early 2000, a Minerals Program was developed in consultation with the minerals industry, and other stakeholders within the province. In addition to the new program the AGS joined a collaborative Geological Survey of Canada (GSC), Saskatchewan Energy and Mines, AGS and industry funded EXTECH study on the Athabasca Basin.

The AGS Minerals Section, in conjunction with the GSC, also proposed and successfully obtained a Targeted Geoscience Initiative (TGI) geochemical survey program, which began in June 2000. This project focuses on methodology, combining the expertise at the AGS and GSC to develop the geochemical survey and integrate it with the other programs. Northern Alberta is boggy and underlain by Quaternary sediments of variable thickness. This environment poses new challenges that require a series of orientation studies prior to a full-scale survey. Results will be of interest in other areas of Canada with geologic environments similar to that of northern Alberta. The program will also help to target areas and set procedures in northern Alberta as part of the new national Co-operative Mapping Strategy.

Other significant growth areas for the immediate and long term future of the AGS are in energy related areas. The AGS obtained $402 000 from the federal government under the Western Economic Partnership Agreement (WEPA), and $254 000 from the Alberta Science and Research Authority (ASRA), to study the hydrogeology of the post-Paleozoic succession in the Athabasca Oil Sands area. ASRA through the Alberta Research Council provided $374 000 for study of the coal bed methane potential of the province, and also the potential Enhanced Coal Bed Methane (ECBM) production and associated CO_2 sequestration in coal seams in Alberta.

AGS staff also supported the regulatory activities of the EUB through expert advice and participation in hearings, including in the major Gulf-Surmont hearing on shut-in gas production from gas pools overlying bitumen reservoirs in oil sands areas.

Program

As a result of priorities set by government, particularly in the Ministry of Resource Development (consisting of the Department of Resource Development (DRD) and the Alberta Energy and Utilities Board (EUB)), the AGS developed and implemented a new balanced

program that reflects new directions and satisfies the needs of its stakeholders. The program has two main thrusts:

- ✔ continuing support of Energy development; and,
- ✔ "ramping-up" the effort in support of Minerals development.

In addition, the AGS program provides for ongoing activities in support, data, and information dissemination, and in the provision of expert advice. The *Information Management* component of the AGS program is addressing the management of geoscience information currently collected or produced at AGS. Because AGS is facing, in the near future, an intergenerational transfer of knowledge and expertise, a "*Legacy Information*" inventory project was also set up, to document all historical data and information in the AGS' possession. The AGS is also participating in the Canadian Geoscience Knowledge Network (CGKN) as part of developing mechanisms to manage and disseminate geoscience information.

Energy Resources Program

The AGS is concentrating its efforts in supporting the intensive energy development in the Athabasca Oil sands area in northeastern Alberta. Industry's geoscience needs are in improving the reservoir characterization of Alberta's oil sands, and in identifying sources of water and of wastewater disposal sites for in situ thermal projects. Also, in response to Ministry's needs, the AGS is developing a long-term program to establish the potential for, and producibility of, coalbed methane in Alberta. To meet government and industry needs and interest in meeting the CO_2 emission-reduction targets agreed on in Kyoto, AGS is studying the potential for CO_2 sequestration in geological media in Alberta.

Current Projects

- ✔ Facies analysis and mapping of the oil sands in northeastern Alberta, to characterize, at the reservoir scale, the geology of the Athabasca Oil-Sands Deposit.
- ✔ Geological and hydrogeological support to EUB in the hearing addressing the issue of gas production from pools overlying bitumen reservoirs.
- ✔ Baseline groundwater assessment of the Quaternary and Cretaceous succession, Athabasca Oil-Sands area, in support of sustainable development of the oil sands reservoirs using water-intensive in-situ methods.
- ✔ Tectonostratigraphy and aquifer characterization of the Paleozoic succession, Athabasca Oil-Sands area, to evaluate the potential for injection and long-term isolation of produced and process waste-waters into saline Paleozoic aquifers within the area.
- ✔ Geological support to a consortium project led by the Alberta Research Council on CO_2 sequestration in uneconomic coal beds and concurrent enhanced coalbed methane production.
- ✔ Implementation of a coalbed methane data base to evaluate the coalbed methane (CBM) potential and producibility in Alberta.
- ✔ Characterization of salinity and pressure regime of formation waters in Alberta, for the identification and characterization of specific sites suitable for CO_2 sequestration in geological media near major CO_2 producers throughout Alberta.

Mineral Resources Program

The mineral resources program focuses on studies of metallic/non-metallic minerals, including diamonds, industrial minerals, and sand and gravel. The program provides for both regional and thematic studies.

Current Projects

- ✔ Quaternary and surficial mapping, at 1:250 000 scale, of the Pelican and Peerless map areas (83P and 84B).
- ✔ Orientation soil and bio-geochemical surveys over selected kimberlitic diatremes at the Mountain Lake (83N), Buffalo Head Hills (84B) and Legend (84A) areas.
- ✔ Orientation stream sediment surveys over potentially metalliferous shales in the northern Birch Mountains area (84H).
- ✔ Preparation of updated, digitally accessible compilations of diamond indicator minerals and metallic mineral occurrences for Alberta.
- ✔ Compilation into digital form of the previously completed aggregate mapping for parts of Alberta, and planning to

re-initiate in the near future an expanded aggregate mapping program.

- ✔ Compilation into digitally accessible form, from literature sources, of the known and inferred faults associated with the Peace River Arch in northern Alberta.
- ✔ An interpretation of Radarsat1 and Landsat TM5 and TM7 imagery in northern Alberta for terrain characterization and to identify possible fault lineaments and their spatial relationship to known kimberlitic diatremes and metallic mineral occurrences.
- ✔ Study of drill core from three holes recently drilled by private industry into the Steen River Structure in northwestern Alberta (84N).
- ✔ Compilation of prior industry drilling and drill core now in storage at the AGS's Mineral Core Research Facility (MCRF) for the western portion of the Athabasca Basin located in Alberta (as part of Extech study done jointly with Saskatchewan Energy and Mines, Geological Survey of Canada and industry participants).
- ✔ Selected thematic studies, including:
  - (a) compilation of existing geochemical information from assessment reports for the northern Birch Mountains area;
  - (b) preparation of a catalogue of airborne and ground geophysical surveys (excluding seismic) for Alberta;
  - (c) preparation of a bibliography of currently available 'diamond' and 'kimberlite' related references pertaining to Alberta;
  - (d) a study of the possible relationship between lightning strikes and known and inferred bedrock faults in northern Alberta: and,
  - (e) completion of a petrographic study of selected drill core from the Mountain Lake kimberlitic diatreme.

Finally, the AGS has recently hired a new Leader for the Minerals Section, an experienced Geochemist and an experienced GIS-geologist. As well, before the end of 2000, the AGS is planning to hire a second Quaternary geologist, a second Aggregate-Industrial Minerals geologist, a second Mineral Deposits geologist, and a Stratigrapher-Sedimentologist. These new staff, in conjunction with the AGS's existing experienced scientific and support staff, will continue to advance minerals related research for Alberta for the benefit of the exploration industry and other AGS stakeholders.

Geoscience Support Section

This Section provides administrative, financial, clerical, communication and information technology support to the AGS Group. It also manages and operates the AGS Library and the Information Sales office.

The migration of the AGS information technology infrastructure is continuing. All workstations are now Intel based running Microsoft's Windows NT operating system. A great deal of resources, both in time and money, has been invested in identifying the required software applications on the new computing platform, purchasing the applications and training geoscience staff in their use. The process of migrating AGS' databases and supporting applications, forms and reports to the NT Server platform has begun and will continue into the next year.

The AGS Library has been accepted into the NEOS Library Consortium, joining other public libraries such as those at the University of Alberta and the University of Calgary as a full member in the Consortium. This confirmation of membership will allow AGS' geoscientists to continue to enjoy efficient access to the Consortium member's collections.

The AGS Information Sales office continues to move towards distributing AGS' publications as digital products. Where possible, all new publications will be offered as digital products.

Metallic and Industrial Mineral Assessment

Mineral assessment reports from August 1999 to August 2000

Number of permits represented	1394
Number of reports filed	25
Area hectares	12 331 300
Total value	$20 241 000

Commodities included with the assessment reports:

Diamond	14
Diamond/gold/base metals	8
Precious metals	1
Silica sand	1
Limestone	1

United Industrial Services is now producing foundry and frac sand from a Cretaceous-age silica deposit north of Peace River.

Saskatchewan Program Highlights 2000

Funding for the Saskatchewan Geological Survey remained unchanged in 2000-2001 at almost $2.5 million inclusive of professional and support staff salaries, summer student hiring, and operational expenditures. Several new projects were initiated; most are being undertaken in partnership with the Geological Survey of Canada, various universities, industry and in some cases other provincial government departments.

Precambrian Geology

Four new major projects were started in 2000, all are partnerships with the Geological Survey of Canada and in some cases other organizations:

1) The EXTECH IV - Athabasca Uranium Study is a collaborative 3-year study of the Athabasca Basin and its uranium deposits. Other funding partners are Cameco Corporation, COGEMA Resources Inc. and the Alberta Geological Survey (AGS). The research team also includes the Saskatchewan Research Council as well as scientists from the universities of Regina, Saskatchewan and Laurentian. There are two main objectives to this investigation: 1) to improve understanding of the Athabasca Basin and the context of its uranium deposits; 2) to develop new technologies for exploring for uranium, particularly in the deeper part of the basin.

2) The Uranium City Area Mapping Project is a an initiative to better understand the geology of the Uranium City area and its influence on a number of mineral occurrences including uranium, gold, base metal (copper and zinc), platinum group metals (PGM) and Rare Earth Elements (REE). In 2000, the project entailed geological mapping and a multiparameter airborne geophysical survey.

3) The objective of the 3-year Phelps Lake Project (NTS map-sheet 64M) is to evaluate the mineral potential of a 12 400 km^2 area in northeastern Saskatchewan. This work, which included a multiparameter airborne geophysical survey in 2000, is being undertaken in order to identify mineral development opportunities and to provide background geoscience information to help in the selection of the boundaries of a large Representative Areas Network site (park) proposed for the Phelps Lake map sheet.

4) The Flin Flon VMS Project, which also includes the Manitoba Geological Survey and Laurentian University, is an investigation into the context of and alteration process associated with the Flin Flon VMS deposits. The main components of this investigation will begin in 2001.

The La Ronge - Lynn Lake Bridge Project, in the fifth and final year, is also a collaborative investigation with the GSC. Field work in 2000 involved fill-in mapping to complete coverage of the northeastern extension of the Central Metavolcanic Belt of the La Ronge Domain to the Manitoba border. Work also continued on an investigation of the structural context of gold mineralization in the vicinity of the Byers Fault Zone, Central Metavolcanic Belt.

Industrial Minerals

Investigation of sodium sulphate deposits continued in the 2000 field season. An electrical resistivity tomography (ERT) survey was conducted to investigate the interaction between relatively fresh groundwater and lake brine seeping through the lake basin under the influence of gravity. Collection of brine chemistry data from oil well samples continued. A major new initiative to summarize and synthesize exploration for diamonds in Saskatchewan was initiated late in 2000. The anticipated result is an open file report tentatively scheduled for publication in late 2001 or early 2002.

Petroleum Geology

Projects focusing on a) Upper Cretaceous strata in southwestern Saskatchewan, b) lower Paleozoic strata, and c) production of annotated digital and hard-copy 1:2 000 000-scale structure and isopach maps of the province's main Phanerozoic stratigraphic units are ongoing. Final hard-copy versions of the first four map sheets in the lower Paleozoic series are now available. Joint studies with the Geological Survey of Canada, United States Geological

Survey, Manitoba Energy and Mines, and the Geoscience Departments of the Universities of Alberta, Regina, and Saskatchewan continue to be productive. Summaries of many of these and other geoscientific research projects were published in part one of the department's two-part Saskatchewan Geological Survey Summary of Investigations.

The Petroleum Geology Branch of the Saskatchewan Geological Survey, in collaboration with the Universities of Regina, Saskatchewan and Alberta, will launch a new project in late 2000 or early 2001 to develop a comprehensive geoscience framework for the Weyburn-Midale area in southeastern Saskatchewan. This study is part of the multi-million dollar International Energy Agency Weyburn CO_2 Monitoring and Storage Project to assess the potential of carbonate strata for storage of CO_2 in Saskatchewan and globally.

Drilling activity in the province increased dramatically with the increase in the price of oil. New staff have been hired in the Petroleum Geology Branch to process the resultant large volume of well data. The Subsurface Geological Laboratory has not experienced a similar increase in the use of its facility for core and sample examinations over that seen in 1999.

Computerization

Digital product and processing capability continues to develop not only in the Saskatchewan Geological Survey but also throughout the Saskatchewan Department of Energy and Mines (SEM). GIS software is being used to aid in map production and geological interpretation. All current Precambrian geology maps included with the Summary of Investigations are produced using AutoCAD and FieldLog on digital bases provided by Saskatchewan Land Information Services (SLIS). The maps and associated data files are available digitally. The Geological Atlas of Saskatchewan CD-ROM version 3 (2000), released at the 2000 Open House Meeting in late November, includes several new datasets as well as updates and enhancements of datasets included on previous releases. The 1:250 000-scale Compilation Bedrock Geology Map Series is in the process of being digitized, edge-matched and updated with an estimated time for completion by 2002. Mineral disposition maps have been converted to digital format and will be available for release pending basemap licensing and pricing agreements with SLIS. Assessment work area maps and mineral deposit information are available digitally. Rationalized detailed gravity data for southern Saskatchewan was released this year on CD-ROM as a joint SEM/GSC product.

The Saskatchewan Geological Survey is represented on the Canadian Geoscience Knowledge Network (CGKN) Implementation Committee whose purpose is investigate and develop methods to establish computerized links to all government geological surveys in Canada and provide national and international access to Canadian geoscience knowledge. The first step in this process, the preparation of a CGKN Online Geoscience Catalog which will allow textual and graphical searches of available publications, is in progress.

The internet site for the department, www.gov.sk.ca/enermine, will continue to see the addition of information items. SEM and SLIS have formed a partnership to provide Energy and Mines data for purchase and download over the internet within the next year. Initial products targeted for internet availability include mineral disposition maps and several datasets currently included on the Geological Atlas CD-ROM.

Mineral Resource Assessments

Regional mineral resource assessments (MRAs), of known and potential mineral and petroleum resources, are being done in response to Saskatchewan's Representative Areas Network program to preserve ecological diversity, and regional integrated land use planning processes. Appraisals at a scale of 1:250 000 have been completed for most of the northern portion of the province and for selected areas in the south. MRAs completed in the last year include NTS map sheets 64D, 64E, 64M, 73O, 74A, 74B, 74F, 74H, 74K, 74N, and 74O. The ultimate goal is to complete MRA coverage for the entire province. Developed by the Ontario Geological Survey, the mineral assessment methodology is qualitative and integrates, through a structured process, geoscience and mineral and petroleum exploration and development data with assessment

criteria derived from descriptive mineral deposit models. Participation of the mineral and petroleum industries is a critical component of the process. Digital geological compilation and mineral resource assessment maps are the main products of the assessments. These are being upgraded to a GIS format over time.

Exploration and Development

Grassroots mineral exploration expenditures are estimated to be $32.3 million in 2000, compared to actual expenditures of $23.7 million in 1999, $30 million in 1998 and $43 million in 1997. Forecasted expenditures for 2000 reflect a reversal in the downward trend of the previous two years. These numbers exclude uranium, base metal and gold test mining, and underground exploration costs of $224 million in 1999 and estimated expenditures of $106 million in 2000. As of December 1, 2000 the area of claims in good standing was 2.3 million hectares. This compares with 2.7 million hectares at the end of 1999 and 3.3 million hectares at the end of 1998.

In 1999, expenditures on uranium exploration decreased to $14 million from $22 million in 1998 and $27 million in 1997. This downward trend is expected to level out in 2000 when it is forecast that exploration expenditures will be $15.4 million.

In 2000, Saskatchewan continued its preeminence in uranium production accounting for 100% of Canadian and approximately 30% of world output. This year saw the official opening of both the McArthur River and McClean Lake mines, a new generation of mines in the Athabasca Basin. At Cluff Lake, higher grade ore has resulted in the tailings management area being filled at a lower rate than anticipated. This, plus a program to lower operational costs, means that operations will be extended into 2001 rather than being suspended at year end as originally announced.

Although the potential for the discovery of new gold orebodies is high, the depressed price for gold continues to curtail exploration activity which was $1.0 million in 1999 and is estimated at $1.4 million in 2000. The Seabee gold mine, of Claude Resources Inc., produced 54 100 ounces gold in 1999 and 41 570 ounces gold in the first three quarters of 2000. Since its opening in November 1991 to the end of September 2000 the Seabee gold mine had produced more than 490 000 ounces gold.

Exploration for Cu-Ni sulphides and PGMs is expected to increase dramatically in 2000 to $4.5 million versus actual expenditures of $0.9 million in 1999. This activity is taking place in a number of different areas in the shield including the Tantato Domain, Peter Lake Domain, Rottenstone mine area of the Rottenstone Domain and the sub-Phanerozoic part of the Glennie Domain. Base metal exploration continued in Shield and sub-Phanerozic programs mostly west and southwest of Flin Flon. Exploration expenditures were $5.4 million in 1999 and are estimated to remain steady at $5.3 million in 2000.

Although expenditures on diamond exploration were only $1.4 million in 1999 a significant increase is forecast for 2000 when its is estimated that $5 million will be spent. Most of this activity will be in the Fort a la Corne area where more that 70 kimberlite bodies, many of which are macrodiamond-bearing, have been identified.

In conjunction with the oil and gas price increases that have occurred in 2000, drilling activity in the province has risen by 50% from 1999. It is estimated that approximately 2500 oil wells and 1200 gas wells will be drilled in 2000; this compares with 1391 oil wells and 1038 gas wells drilled in 1999. Petroleum producers in the province enjoyed record high oil and gas prices, with up to $50 (Cdn) per barrel received at the well-head for light oil. Total exploration and development expenditures for the year will once again substantially exceed $1 billion. During the 1999/2000 fiscal year, the petroleum industry provided around 17 000 jobs in the province and generated approximately $730 million of resource revenue (royalties and taxes) for the province. With the increase in oil and gas prices, these jobs and revenues are expected to be significantly higher for the current 2000/2001 fiscal year.

The pace of exploration for deep Ordovician light oil reservoirs slowed considerably in 2000 compared to the previous three years but new discoveries continue to be made in southeastern Saskatchewan.

Manitoba Program Highlights 2000

Introduction

In 2000, geological programming in Manitoba continued to focus on stimulating socio-economic development by fostering a positive business climate for investment in mining and exploration within the province. By developing an understanding of Manitoba's geology and geological processes, the MGS also contributes to sustainable development and informed land management decisions. To help meet these objectives, funding for the Manitoba Geological Survey was increased 7.2% in 2000 to $4.4 million.

Geoscience Program

The 2000–2001 geoscience program reflects a balance between providing support to traditional mining camps, stimulating new exploration and development opportunities in frontier areas, and supporting land-use and development priorities in southern Manitoba. The program is reviewed annually by the Mineral Exploration Liaison Committee (MELC), composed of members of the Mining Association of Manitoba, the Manitoba Prospectors and Developers Association, and the Manitoba–Saskatchewan Prospectors and Developers Association, as well as representatives from the University of Manitoba and the Geological Survey of Canada.

Geoscience programming in Manitoba is delivered through a combination of provincially funded and collaborative projects. The partnered initiatives include contributions from the federal government, the mineral exploration industry and several Canadian universities. These partnerships are anticipated to add an additional $1.0 million to operating field expenditures in 2000–2001, effectively matching the amount of operating funds spent on geoscience by the province.

Precambrian Mapping

The NATMAP Shield Margin project, completed in 1998 with the publication of a set of 1:100 000-scale compilation maps and accompanying notes, was the culmination of twenty years of MGS mapping and mineral-deposit investigations in the Flin Flon Belt. The scientific results of the Shield Margin Project have now been published in two volumes of the Canadian Journal of Earth Sciences (January and November 1999). A CD-ROM containing the compilation maps and a variety of other digital data sets was released in May 2000.

Additional follow-up work was conducted within the boundary zone between the Lynn Lake Belt proper and the Kisseynew Domain following the publication of new trace-element data from the Lynn Lake Belt in 1999. This work helps to define the extension of Lynn Lake Belt tectonostratigraphic assemblages into the more highly deformed and recrystallized domain to the south.

The MGS has turned a significant part of its attention to the Thompson Nickel Belt (TNB), an area that, despite its economic importance to the province, has historically had relatively little provincial survey work due to limited bedrock exposure and a large amount of hitherto confidential company information. Recognition by all stakeholders that the public geological database for this world-class mineral belt required major updating resulted in two initiatives, both supported by industry and both entering their final stages in 2000–2001:

- ✔ Compilation of the geology of the exposed TNB and its sub-Phanerozoic extension, begun in 1995, has been made possible by the co-operation of INCO Ltd., Falconbridge Ltd., and Hudson Bay Mining and Smelting Co. Ltd., allowing MGS access to virtually all private-sector information in the TNB. Preliminary versions of the maps are planned for publication in the spring of 2001.
- ✔ The Thompson Nickel Belt CAMIRO project brings researchers from universities and government together to develop new

exploration tools for the TNB in a four-year (1997–2001) study, in part funded by industry (*see* below).

The Western Superior NATMAP project, now in its fourth year of operation, aims to provide a modern geoscience synthesis of northwestern Ontario and eastern Manitoba, using the combined resources of the federal, Ontario and Manitoba geological surveys. Key areas have been selected to address questions regarding relationships between Mesoarchean and Neoarchean sequences of the western Superior Province, through new mapping, geochemistry, geochronology and GIS-based compilation. Regional, 1:20 000 to 1:50 000-scale, bedrock geological mapping conducted by the MGS in support of the Western Superior NATMAP includes work in the Knee Lake–Gods Lake, Stull–Kistigan–Edmund lakes, and Max Lake–Aswapiswanan Lake areas. In southeast Manitoba, a collaborative GSC–MGS mapping program in the Black Island area of southeastern Lake Winnipeg was undertaken to characterize the nature of the boundary between two important tectonic elements of the western Superior Province, the North Caribou Terrane and the Uchi Subprovince.

An MGS and NSERC-supported, integrated mapping, geochemistry and isotopic study of the Western Superior craton margin northeast of Thompson has been partnered with researchers from the University of Alberta. Over the past three years, this work has resulted in a re-interpretation of the location and nature of the boundary zone between the Archean Superior Province and the Paleoproterozoic Trans-Hudson Orogen. Combined Sm-Nd isotopic and U-Pb geochronological results indicate that in the northern Superior Boundary Zone, Paleoarchean to Mesoarchean crust underwent a complex and prolonged history spanning more than two billion years.

Mineral Deposits Investigations

Mineral deposits investigations complement mapping projects by providing focused work on geological problems with a distinct economic theme.

A Targeted Geoscience Initiative project in the Flin Flon area draws on the combined resources of the GSC, the MGS and the Saskatchewan Geological Survey. Titled *"Regional hydrothermal systems as an exploration guide, Flin Flon mining camp, Manitoba and Saskatchewan"*, this project will include studies of footwall and hanging wall alteration associated with the Flin Flon–Callinan–777 stratigraphic interval, regional deformation patterns affecting the Flin Flon VMS horizon, the nature and distribution of hydrothermal alteration within selected portions of the greater Flin Flon area, and the geochemistry of the Flin Flon massive-sulphide deposits.

A variety of new initiatives began in 2000 in the Lynn Lake region, in response to the closure of the Keystone mine's Farley deposit, formerly the only active mining operation in Lynn Lake. Many MGS investigations in the Lynn Lake greenstone belt are intended to improve understanding of processes involved in the formation of gold mineralization in the region. These initiatives include new regional and detailed structural mapping (including M.Sc. and Ph.D. thesis projects), selected multimedia geochemical surveys, and a GIS compilation project that will house newly acquired and older public domain information. An additional M.Sc. study utilizes existing and new digital data sets in the Lynn Lake area to develop a predictive tool for gold exploration.

In the Thompson Nickel Belt, a Canadian Mining Industry Research Organization (CAMIRO) Project has a combined industry–NSERC budget of approximately $800 000. The MGS coordinated and led the project until August of 2000, when personnel changes required that these responsibilities be split between co-leaders at the University of Manitoba and Laurentian University. The project currently has five industry sponsors (INCO Ltd., Falconbridge Ltd., Hudson Bay Exploration and Development Ltd., Billiton Metals Canada Inc. and Western Mining International Ltd.) and researchers from the GSC, the University of Manitoba, Laurentian University, the University of Alberta, the University of Quebec at Montreal, and the University of Saskatchewan.

A number of projects have a theme related to platinum group elements (PGE). A major

new digital compilation of PGE geological and geochemical data throughout Manitoba was released in spring 2000. In the Fox River Belt (FRB), the largest continuous segment of the Superior Boundary Zone in Manitoba, Falconbridge Ltd. launched a major Ni-Cu-PGE exploration program. This new exploration work provided the MGS with an opportunity to partner logistics with Falconbridge and begin a multiyear geological investigation of the metallogeny, petrogenesis and tectonic evolution of the FRB. Site-specific PGE investigations were also conducted in the Bird River Sill and Mayville intrusion, in southeast Manitoba.

Geochemical Surveys

Manitoba's five-year Northern Superior initiative is now in its final year of data collection. Begun in 1996, this initiative involves helicopter-supported multimedia geochemical surveys targeting greenstone belts in the northern Superior Province. During the 2000 field season, approximately 2000 rock, till, b-horizon, humus and vegetation samples were collected for multi-element geochemical analysis from 350 sites within the northern portion of the Knee Lake greenstone belt. In addition, 334 bulk samples of till and beach sand were collected for identification and analysis of kimberlite indicator minerals. The geochemical and mineralogical analysis of these samples will continue to build a multi-element–multimedia geochemical database to assist mineral-resource assessment in the region.

Phanerozoic Investigations

The MGS continues to promote exploration and development opportunities for specialty and nonmetallic minerals, both on the Precambrian Shield and in the Phanerozoic-covered portions of south-central Manitoba.

Increasing evidence for post-Precambrian structural movements within the buried portions of the Superior Boundary Zone–Thompson Nickel Belt suggest that such late structures may have produced channelways for deep fluid migration from the buried Precambrian basement through the overlying Phanerozoic strata. Geochemical anomalies and the presence of sphalerite in drillholes penetrating Devonian formations in this region suggest that such fluid migration and mineralization may indeed have taken place during the Phanerozoic.

Stratigraphic investigations and drilling programs were carried out for various projects in south-central Manitoba. In 2000, the Capital Region Study was extended to the south, and the maps and report are in the editing stage for the entire project. The Manitoba Stratigraphic Database (MSD) continues to be updated with the addition of historic tops to 437 wells. Five coreholes were drilled by the MGS for stratigraphic purposes in the Dancing Point (Lake Winnipeg), High Rock Lake, Wekusko Lake and Winnipegosis areas.

Surficial Geology

The MGS and the GSC are co-operating through NATMAP in a program of geological mapping for the Winnipeg Region, with emphasis on engineering and environmental geology. Surficial mapping was completed in two phases for the area from 49° to 51°N and from 95° to 98°W. The current emphasis of the NATMAP and related MGS programs is on the completion of a three-dimensional (3D) digital geological model for all Phanerozoic sedimentary rocks and Quaternary deposits.

The MGS and the GSC have initiated a multidisciplinary research program to reconstruct the pre-instrumental flood history of the Red River and to assess the importance of geological processes that may be increasing the flood hazard. The project is using a variety of geological and biological records to provide annual reconstructions of important hydroclimatic variables over the last several thousand years and provide a proxy record of high-magnitude floods in the Red River valley.

Industrial Minerals and Aggregate Investigations

Precambrian and Phanerozoic bedrock outcrops and quarry locations in the Churchill area were inventoried during a brief visit to the region. Current production is mainly for aggregate and minor building stone. The MGS also

conducts aggregate-resource studies in southern Manitoba, work that contributes to the resource management and land-use planning decisions made by district planning boards. In 2000, 1:50 000-scale aggregate resource studies were conducted in the Rural Municipality of Cameron, covering eight townships in southwestern Manitoba near the town of Hartney.

Geoscience Information Section

The 'GIS Map Gallery' at www.gov.mb.ca/em/geoscience/gis/gis-index.html, is the department's new access point for information on mineral claims, assessment files, orthophotography and geological databases. To access the database, clients use an Internet connection and a JAVA-enabled web browser such as Microsoft Internet Explorer™ or Netscape Navigator™. The website has a user-friendly GIS style, with tools that allow query and analysis of the most current data sets relevant to the mining and mineral exploration community.

The Bedrock Geology Compilation Map Series (BGCMS) was initiated in 1985 to provide uniform 1:250 000 geological compilation maps for the entire province, initially focusing on areas of high mineral endowment and/or high mineral potential. Digitization of all existing manually drafted BGCMS maps is almost complete, and map production is now 100% digital, using ArcInfo™ GIS technology. There are now 29 BGCMS maps covering more than half of the province, including the entire Churchill Province, core areas of the Superior Province, and the Capital Region of southern Manitoba.

Ontario Program Highlights 2000

Introduction

Geoscience responsibilities for Ontario are delivered by:

- ✔ Precambrian Geoscience Section (PGS – Precambrian bedrock mapping and airborne geophysics);
- ✔ Sedimentary Geoscience Section (SGS – surficial geology and geochemistry, Paleozoic mapping and aggregate);
- ✔ Resident Geologist Program (RGP – front line customer service and mineral occurrence mapping);
- ✔ Publication Services Section (PSS – map and report preparation and library function through Information and Marketing Services Section);
- ✔ Data Services Section (DSS – digital information archive and distribution);
- ✔ Geoscience Laboratory (GL – geochemical analysis service);
- ✔ Mining Lands Section (approval of assessment files);
- ✔ Mines Group (industrial mineral and building stone expertise).

The OGS is part of the Mines and Minerals Division, Ministry of Northern Development and Mines (MNDM). Those administrative units that comprise the Ontario Geological Survey (OGS) are PGS, SGS, RGP, and elements of the PSS, DSS and GL.

The geoscience program is focused on the support of the minerals industry.

The 1999-2000 base budget for the geoscience activities of the Mines and Minerals Division (see budget table) was approximately $11 031 300. This budget covers salary and operational expenses for the geological mapping function, the Resident Geologist function, the Geoscience laboratory function, geoscience assessment function, the library function, the publication function and the data warehouse and distribution functions.

The MNDM Internet address is: www.gov.on.ca/MNDM/mines/mmdhpage.htm

Geoscience Activities – Highlights

Economic Activity

Listed according to commodity, significant exploration projects in Ontario include:

Diamonds

- ✔ Victor Kimberlite Project, De Beers Canada Exploration Corporation.
- ✔ Gem Quality (GQ) Project, Band-Ore Resources Ltd.
- ✔ Spider #1 – Kyle Lake Project, KWG Resources Inc. / Spider Resources Inc.

Gold

- ✔ #17 Zone, Nuinsco Resources Ltd.
- ✔ Hemlo Project, Franco-Nevada Mining Corporation Limited.
- ✔ Owl Creek Mine, Kinross Gold Corporation.
- ✔ Markes Property, Pele Mountain Resources Inc.
- ✔ Vega Project, River Gold Mines Ltd.
- ✔ Pickle Crow Project, Wolfden Resources Inc./ (Cantera Mining Ltd.)

PGE

- ✔ Agnew Lake intrusion River Valley area, Pacific Northwest Capital / Anglo American Platinum (Amplats).
- ✔ River Valley intrusion, Aquiline Resources Inc/Mustang Minerals.
- ✔ River Valley intrusion, Mustang Minerals / Impala Platinum (Implats).
- ✔ East Bull Lake, Mustang Minerals Corp. / Falconbridge Ltd.

Petalite and rare metals

- ✔ Big Whopper (Separation Rapids Project), Avalon Ventures Ltd.
- ✔ Big Mack (Separation Rapids Pegmatite Project), Emerald Fields Resource Corp.
- ✔ Pakeagama Lake, Houston Lake Mining.

Cobalt

- ✔ Werner Lake, Canmine Resources Ltd.

Silica

✔ Croxall-Vukosanovich deposit, J. Croxall & E. Vukosanovich / Nortem.

Nickel-Copper

✔ Totten, Inco Limited.

Vermiculite

✔ Cavendish, Regis Resources.

Graphite

✔ Diamond Lake Minerals.

New or Expanded Operation

Gold

✔ Eagle River, River Gold.

Nickel-Copper

✔ Onaping Deep Project, Falconbridge Ltd.

✔ Kelly Lake, Inco Limited.

Barite

✔ North Williams Township, Extender Minerals of Canada Ltd.

Talc

✔ Conley Mine, Canada Talc.

Palladium Platinum

✔ Lac des Iles, North American Palladium.

Zinc/Copper

✔ Kidd Creek, Falconbridge Ltd.

Geoscience Program Highlights

Precambrian Geoscience Section

The core activities of the Precambrian Geoscience Section (PGS) in 2000-01 were focussed on:

- ✔ Geology and metallogeny of high mineral potential areas in the Superior, Southern and Grenville provinces;
- ✔ Documentation of features and setting of provincial-scale commodities (diamond potential in kimberlite and kimberlite-like intrusions, rare-metal and petalite-bearing pegmatite mineralization, Ni-Cu-PGE mineralization;
- ✔ Provincial-scale documentation of key geologic environments (*e.g.*, distribution of FI-FIII rhyolite and metamorphic assemblages);
- ✔ Human resource strategy, digital data standards and project management practices);
- ✔ Maintenance of 20 collaborative projects with universities, governments and private sector to complement the bedrock mapping and airborne geophysical programs.

Sedimentary Geoscience Section

The activities of the Sedimentary Geoscience Section (SGS) in 2000-01 were focussed in the following fields:

Surficial Geochemistry – Five lake sediment sampling projects, designed to assess mineral potential, were augmented by site specific applied research on exploration techniques in areas of thick drift in the Abitibi region. The study areas are primarily located within greenstone belts.

Surficial mapping and sampling – a program to determine the diamond and metallic mineral potential was conducted in 5 areas of the province. A mix of traditional exploration and frontier areas were covered by the projects.

Industrial Mineral Assessments – Aggregate inventories, completed as part of an on-going provincial program, were undertaken in 3 areas to assist long-term resource use planning. Complementing these were Paleozoic bedrock aggregate and shale quality investigations completed to meet pressing client/industry demands.

Partnerships – joint projects with industry, academia and various government agencies, are a key element in augmenting the program of SGS. These diverse projects included terrain evaluations, data compilation and mineral exploration methods development.

In addition to the above, SGS staff undertook or collaborated in a number of thematic studies. Prominent among these are: kimberlite indicator grain geochemistry; digital data collection methodology; and regional map compilation. SGS was also called on to provide geological data and interpretations in

support of land use issues being debated in the public domain.

Resident Geologist Program

Staff of the Resident Geologist (RG) Program continued to focus on delivering top quality information and consulting services to our mineral sector clients throughout 2000, as evidenced by the program recording greater than 90 percent client satisfaction ratings for overall program performance and services in consecutive independent surveys conducted over the past two years. During 2000 program staff responded to approximately 18 500 office visits and 19 700 telephone inquires, conducted more than 400 client property visits/field investigations and over 90 mine/quarry visits, and provided/lead approximately 100 geological field trips. To assist the Ministry in its role as the steward of the Province's mineral resources and in response to the many land use planning/management initiatives undertaken by the Ontario Government in recent years, a new land use planning unit consisting of a provincial coordinator and 3 regional land use geologists has been created within the RG Program. The primary focus of the land use planning unit is to maximize Ontario's land base for mineral exploration and development in a safe and environmentally responsible manner. Another main accomplishment of the RG Program in 2000 was the successful launch of the program's internet website. We invite you to come and explore Ontario at: www.gov.on.ca/MNDM/MINES/mmdhpge.htm

Information and Marketing Services Section

The Information and Marketing Services Section (IMS) is responsible for marketing the geoscience, tax and infrastructure advantages of Ontario for investment attraction purposes. Marketing plans for 2000 include 20 trade shows, of which 9 are international and 12 are national events. IMS also has responsibility for maintaining the Geoscience Library services and the cartographic and hardcopy publication functions of the Mines and Minerals Division, through the Publication Services Section (PSS). Between September 1999 and August 2000, 33 maps, 30 reports, 10 digital information products and 7 digital data sets were released.

Data Services Section

The role of the Section is to assist the information gathering, access and distribution goals of the Mines and Minerals Division by:

- ✔ Developing and maintaining digital information standards, procedures, databases and access methods; and,
- ✔ Managing the provision of, and in some cases operate, digital data distribution channels.

Current efforts are targeted to implementing access to geoscience, minerals exploration and mining lands administration information via the Internet.

Geoscience Laboratories

Since 1997, staff at the Geoscience Laboratories (Geo Labs) reduced sample turnaround times from an average of 171 days to 26 days, increased the number of analytical test offerings, established an international marketing image, increased private sector clients from 49 to 346, and achieved ISO 9002 accreditation between 1997 and 2000.

Staff and management worked together to re-engineer every aspect of the operation and to achieve this incredible transformation. New operating procedures were developed, and staff volunteered to work extra hours and split shifts during peak load times, to achieve these results. For these achievements the Geo Labs received the Provincial Government's Amethyst Award.

In December 2000 or early 2001, Geo Labs will launch its first in-house reference material, OKUM. OKUM is an ultramafic komatiite collected at Serpentine Mountain in McArthur Township, 25 kilometres south of Timmins. This material is characterized for majors plus over 30 additional elements. Target market is geoscience laboratories and geological surveys looking for an inexpensive reference material for quality checks.

Operation Treasure Hunt

Operation Treasure Hunt was extended to a third year with the addition of $10 million, for a total of $29 million over the three years. The goal is to stimulate exploration for mineral deposits and to attract new mineral investment to Ontario using state-of-the-art airborne geophysical, surficial and lithogeochemical, geochemical and data management technologies, and aggregate and industrial mineral inventory techniques. Updated program information is found on the MNDM Internet web page.

Le ministère des Ressources naturelles (MRN) appuie le développement économique durable des régions du Québec en favorisant la connaissance, la mise en valeur et l'utilisation optimale du territoire québécois et de ses ressources énergétiques, forestières et minérales.

Dans ce contexte, GÉOLOGIE QUÉBEC est l'unité administrative du MRN responsable de l'acquisition, du traitement et de la diffusion des connaissances géoscientifiques nécessaires à l'établissement et à la promotion du potentiel minéral du Québec, informations indispensables au bon fonctionnement de l'exploration minérale au Québec.

Géologie Québec réalise plusieurs projets allant du levé géologique de territoires nouveaux à la production de cartes d'évaluation du potentiel minéral, en passant par diverses compilations et le chargement du SIGÉOM (Système d'information géominière du Québec). Toutes ces informations sont rendues disponibles à la clientèle de l'exploration minérale sous forme numérique ou sous format papier. Géologie Québec appuie également l'industrie minière par l'entremise de plusieurs mesures d'assistance financière à l'exploration minière.

En 1999-2000, GÉOLOGIE QUÉBEC dispose d'un effectif de 189 personnes (dont 106 permanents) réparti à Charlesbourg et dans six bureaux régionaux (Montréal, Sainte-Anne-des-Monts, Sept-Îles, Rouyn-Noranda, Val-d'Or et Chibougamau).

L'adresse INTERNET de GÉOLOGIE QUÉBEC est:

http://www.geologie-quebec.gouv.qc.ca/

Le Service à la clientèle de l'exploration et du marketing (SCEM)

Le SCEM regroupe l'ensemble des services au comptoir offerts dans les six (6) bureaux régionaux (Montréal, Sept-Îles, Sainte-Anne-des-Monts, Rouyn-Noranda, Chibougamau, Val-d'Or). Le SCEM offre, en collaboration avec le Secteur des Forêts, des points d'accès à l'information géoscientifique à Sherbrooke et à Hull, en plus des services offerts au bureau de Charlesbourg. Chaque bureau régional est sous la responsabilité d'un géologue résident, et fournit les services suivants:

- ✔ la communication de renseignements généraux sur la géologie, le potentiel minéral, l'industrie minière, sur les programmes d'aide financière et sur la Loi sur les mines;
- ✔ la consultation, la reproduction ou la vente de documents géoscientifiques;
- ✔ l'assistance technique aux utilisateurs du SIGÉOM;
- ✔ la vente et la mise à jour des cartes de titres miniers et le traitement partiel des dossiers relatifs aux titres miniers.

Depuis le 1er juin 1999, le SCEM dispose d'une division du marketing qui s'occupe de la promotion du potentiel minéral québécois sur les scènes locales, nationales et internationales.

Le Service de la géoinformation (SG)

Le SG révise et prépare pour publication les nouveaux documents géoscientifiques (format papier et numérique) faisant état des résultats de travaux géologiques, géochimiques et géophysiques. Le SG compile et numérise les produits de compilation géoscientifique dans le SIGÉOM.

Les informations disponibles dans le SIGÉOM au début de l'été 2000 étaient:

- ✔ la localisation des périmètres des travaux d'exploration provenant des rapports privés d'exploration minière (documents de la série GM), pour l'ensemble de la province;
- ✔ la localisation et la description de plus de 3 500 indices minéralisés de la province ;
- ✔ la localisation et la description de plus de 90 000 forages au diamant de la province;

- ✔ 1249 cartes géologiques de terrain ou de compilation;
- ✔ les résultats d'analyses de sédiments meubles de la province;
- ✔ les produits géophysiques (champ magnétique total résiduel, gradient magnétique vertical, anomalies électromagnétiques);
- ✔ les résultats d'analyses lithogéochimiques.

De plus, la compilation des blocs erratiques est maintenant disponible dans le SIGÉOM. De plus, un nouveau module a été développé pour ajouter des fiches de minéraux industriels au SIGÉOM. Depuis 1998, Géologie Québec fournit à sa clientèle un accès Internet à la base de données bibliographique EXAMINE (quelque 60 000 références du fonds documentaire sur les ressources minérales du Québec). L'adresse Internet d'EXAMINE est:

http://examine.mrn.gouv.qc.ca/

Le Service géologique de Québec (SGQ)

Le Service géologique de Québec dessert un vaste territoire qui comprend les Appalaches, les Basses-Terres du Saint-Laurent, la majeure partie du Grenville et l'ensemble du territoire du Nouveau-Québec situé au nord du 55e parallèle. Une équipe d'une vingtaine de géologues répartie à Charlesbourg, Montréal, Sept-Iles et Sainte-Anne-des-Monts réalise les levés et les études géologiques.

En 2000-2001, le SGQ dispose d'un budget de 4,5 M$ pour réaliser 13 nouveaux projets. Encore une fois cette année, l'accent est mis sur la cartographie géologique. Ainsi, la plus grande partie des ressources sera consacrée à la réalisation de 5 projets qui généreront 6 nouvelles cartes géologiques : 1 feuillet au 1:20 000, 3 feuillets au 1:50 000 et 2 feuillets au 1:250 000.

Au niveau des faits saillants, mentionnons la poursuite, dans le cadre du Programme d'exploration minière du Grand-Nord, de la cartographie géologique du territoire situé au nord du 55ième parallèle (2 feuilles 1:250 000). Ailleurs, les principaux travaux ont été réalisés dans la Province de Grenville c'est-à-dire dans les régions de la Côte-Nord, de Mont-Laurier et du Lac Saint-Jean et dans les Appalaches en Gaspésie.

Le Service géologique du Nord-Ouest (SGNO)

Le Service géologique du Nord-Ouest dessert l'Abitibi, le secteur de la Baie-James et conjointement avec le SGQ, le Grand-Nord québécois. Son effectif est réparti dans trois bureaux régionaux situés à Rouyn-Noranda, Val-d'Or et Chibougamau. En 2000-2001, le SGNO dispose d'un budget de 4,3 M$ pour réaliser 5 projets de cartographie d'envergure et 6 études thématiques ainsi que des travaux de compilation géologique et gîtologique.

Deux projets de cartographie dans le Grand-Nord génèrent de nouvelles cartes géologiques au 1:250 000 et le programme d'exploration du Moyen-Nord a permis de revoir la géologie de sept feuillets au 1:50 000. Les autres projets sont réalisés dans le cadre du plan triennal pour l'Abitibi 2000-2003. Un projet d'inventaire géologique comportant deux feuillets au 1:50 000 a été réalisé dans la sous-province d'Abitibi. Les études thématiques en cours impliquent des travaux de métallogénie, de géochimie, de volcanologie et de géologie structurale, en collaboration avec plusieurs partenaires universitaires et industriels. Les datations géochronologiques se poursuivent en Abitibi et dans les terrains du Nord.

En ce qui concerne l'évaluation du potentiel minéral, les travaux actuels en collaboration avec le SGQ visent à étendre les capacités du module SPCPM dans le SIGÉOM qui produira cette année quatre cartes thématiques au 1:250 000

Le Service des minéraux industriels et de l'assistance à l'exploration (SMIAE)

Le SMIAE regroupe le personnel oeuvrant dans les champs d'activité suivants : les minéraux industriels, la géochimie, la géophysique et les programmes d'assistance financière à l'exploration minière.

Le groupe des minéraux industriels réalise des études dans les domaines de la pierre de

taille, des minéraux non-métalliques, des granulats et de la tourbe. Les responsables de la géochimie et de la géophysique compilent et traitent des données en appui aux travaux d'inventaire géologique effectués par les deux services géologiques.

Le groupe des programmes d'assistance financière a pour mandat de concevoir et d'administrer les programmes d'assistance financière à la prospection et à l'exploration minière:

- ✔ le Programme d'assistance à l'exploration minière disposant de crédits de 6,75 M$ pour les prospecteurs, les entreprises et les fonds régionaux d'exploration;
- ✔ les Fonds d'exploration autochtones avec des crédits de 900 000$;
- ✔ le Programme de soutien aux sociétés juniors d'exploration en difficulté disposant de crédits de 5,0 M$.

Geological Surveys Branch

The Minerals and Energy Division of the Natural Resouces and Energy was recently reorganized to include three branches, namely Geological Surveys, Mines, and Energy Secretariat. The Geological Surveys Branch is responsible for building and maintaining a comprehensive geoscience database for the province and using it to assist mineral exploration and development as well as to advise the government and the public on issues such as land use, environment and construction. The branch has a staff of 26 and two regional offices, one in Bathurst and the other in Sussex. The major activities of the branch are bedrock and surficial geological mapping; studies related to metallic minerals, industrial minerals, and hydrocarbon resources; geophysical and geochemical surveys; coastal zone mapping; and the management of exploration support services.

The preliminary value of New Brunswick's mineral production for 1999 is $857.5 million, a decrease of 0.6% from the final value of $863 million in 1998.

In order to address challenges facing the New Brunswick mining industry, the province recently contracted Dr. George Miller of IGRG Inc. and Dallas Davis of Dalmin Corporation to study the industry and prepare a report (the "Miller Report"). The report presents a strategy and 27 recommendations grouped under the following categories: Exploration and Development; Metal Mining; Smelting and Processing; and Industrial Minerals. This report is available on the internet at: www.gnb.ca/0078/minerals/miller.htm

The Province of New Brunswick has committed to establishing a network of protected areas by the year 2005. Toward this goal, in 1997 Dr. Louis LaPierre was commissioned by the Department of Natural Resources and Energy to develop a proposal for a protected area strategy for New Brunswick. After the release of the LaPierre report, the Department asked Dr. LaPierre to conduct a public consultation that involved 20 public meetings and several hundred submissions to the government. The Department of Natural Resources and Energy later established a stakeholder committee to review the recommendations contained in the LaPierre report. Subsequently, the committee prepared a consensus document. The government is putting together an action plan based on available information. The reports are available on the department's internet site at: www.gnb.ca/0078

In 2000, the province continued to support the Mineral Exploration Stimulation Program that provided a total of $60 000 in assistance to 38 prospectors.

The New Brunswick Exploration Assistance Program (NBEAP), initiated in 1994, provides assistance of 50% of project costs to a maximum of $40 000 per project. For 2000–2001, 13 projects were awarded a total of $350 000.

The Minerals and Energy Division held its 25th Annual Review of Activities on November 6–8, 2000. The program included a fieldtrip, workshop, technical and poster sessions, core shack, trade show and industry forum. Thirty-two participants attended the field trip on "*The Carboniferous of Southeastern New Brunswick*" and 27 participants attended the workshop on "*Porphyry related Cu–Mo–Au Deposits*". Overall, 275 delegates attended the Annual Review of Activities, which was a huge success.

Exploration Highlights

The year 1999 proved to be another challenging year for the New Brunswick exploration industry. As in the past few years, it appears that reduced exploration budgets, market conditions that affect the raising of capital, and refocusing of exploration projects to other jurisdications have affected not only New Brunswick but most of the other Canadian provinces as well. Exploration expenditure surveys conducted for New Brunswick in 1999 point to a 15% decrease from 1999. Preliminary estimates indicate that approximately $8.5

million ($10 million in 1998) was spent in New Brunswick on exploration projects.

This downward trend was more pronounced with respect to the number of claims recorded in 1999 (1771 versus 2500 in 1998, a 29% decrease). Total claim equivalents in effect for 1999 was 21 362. The number of new claims recorded in northern New Brunswick during 1999 was 1343 and the number of claims in effect at year's end was 12 368. For southern New Brunswick, the number of claims recorded in 1999 was 428 and the number of claims in effect at year's end was 2516.

Metallic Minerals

As in past years, most of the activity in northern New Brunswick was focused on base metal deposits. In 1999, more than $6 million was spent on exploration in the Bathurst Mining Camp. Exploration expenditures in the camp have increased to $7 million in 2000. In 1999, exploration in southern New Brunswick was focused on precious metals; exploration continued into 2000. The most vigorous activities were related to the expansion of resources on known gold properties and the search for new gold occurrences in the southwestern part of the province. There, recent work demonstrated that there is excellent potential for substantial gold deposits associated with Sn–W-bearing granites. This environment is strikingly similar to that found in the gold plays developing in the Tintina belt of Alaska and the Yukon.

Industrial Minerals

The New Brunswick industrial rock and minerals sector has continued to grow and expand in response to other sectors of the province's economy, such as construction, agriculture, manufacturing and environment.

Hydrocarbon Resources

The construction of the Maritimes and Northeast Pipeline from the Sable Offshore Energy Project through the Maritimes to Massachusetts in 1999 has spurred a wave of oil and gas exploration activity in New Brunswick that hasn't been seen since the discovery of the Stoney Creek field in 1909. Currently, there are 600 000 hectares of land held under oil and natural gas licences and leases in New Brunswick. In this past year, there have been 9 wells drilled, the greatest number of exploration wells drilled annually in the Province's history. These exploration wells have met with considerable success.

Highlights Of Geological Survey Activities (2000–2001)

Bedrock Geological Mapping

A new 1:500 000-scale "Bedrock Geology Map of New Brunswick" was published in November 2000. It is available on the Internet at:

Detailed (1:20 000 scale) bedrock geological mapping was carried out in the eastern half of Grand Manan Island (parts of NTS 21B/10 and 21B/15), parts of Hampstead (21G/09), and Sussex (21 H/12) map areas of southern New Brunswick, and in the Charlo (21O/16), Upsalquitch Forks (21O/10), Kedgwick (21O/11), and Menneval (21O/14) map areas of northern New Brunswick.

Surficial Geological Mapping and Geochemical Surveys

Surficial mapping was carried out in parts of Kedwick (NTS 21O/11), Menneval (21O/14), and Charlo (21O/16) map areas of northern New Brunswick and Millville (21J/03) and McDougall Lake (21G/07) map areas of southern New Brunswick.

Coastal zone mapping was completed in parts of Miscou Island (NTS 21P/15 and 21P/16) in northeastern New Brunswick.

In cooperation with the Geological Survey of Canada (Target Geoscience Initiative funding), National Geochemical Reconnaissance surveys were carried out in the Coldstream (21J/06) and Haynesville (21J/10) map areas of central New Brunswick.

Metallic Minerals

Staff of the Geological Survey of Canada and New Brunswick Geological Surveys Branch published the *"Geophysical Atlas of*

Massive Sulphide Signatures, Bathurst Mining Camp, New Brunswick," which contains data on 20 major deposits.

Several papers were written for publication in an Economic Geology Monograph volume that is dedicated to presenting data on EXTECH II projects.

A new 1:500 000-scale "Metallogenic Map of New Brunswick" is nearing completion and is expected to be published by December 2000.

Staff continued to update the Mineral Occurrence Database and the publication "Available Mineral Properties in New Brunswick."

Investigations were carried out at the Clarinda and Mount Fronsec base metal deposits in northern New Brunswick.

The Branch is assisting a University of New Brunswick student whose thesis area is the Clarence Stream gold prospect held by Freewest Resources Canada Inc.

Hydrocarbon Resources

The report on the Carboniferous NATMAP project was finalized.

Industrial Mineral Resources

Investigation of the gypsum, anhydrite, silica and titanium resources in New Brunswick continued.

GIS and Annual Summary Reports

The Minerals and Energy Division's geoscience databases (Geoscience Publication, Mineral Occurrence, Borehole, Drill Core, Lithogeochemistry, and Claims) have been or will soon be placed on the New Brunswick Department of Natural Resources and Energy's Intranet site. These databases will be included on the Department's Internet site at a later date.

"Current Research, 1999" and "Abstracts, 2000: 25th Annual Review of Activities" were recently published. "New Brunswick Exploration Highlights, 2000," "Preliminary Review of New Brunswick's Mineral Industry, 2000," and "New Brunswick's Mineral Industry, 2000" reports are in progress.

NATMAP Project

The northern part of New Brunswick is currently the focus of a multi-disciplinary study to evaluate the resource potential and the tectonostratigraphic history of the Gaspé belt. The work is part of a regional NATMAP project termed "Appalachian Foreland and St. Lawrence Platform Architectures in Quebec, New Brunswick and Newfoundland," which consists of five geological transects, two of which extend into northern New Brunswick. The New Brunswick work is co-funded by the New Brunswick Department of Natural Resources and Energy (Geological Surveys Branch) and the Geological Survey of Canada.

The New Brunswick component, which includes the southern part of Transects 3 and 4, will include four map sheets (NTS 21O/11, 12, 13 and 14) and will be carried out over the next four years.

In 1999–2000, geophysical and geochemical surveys were carried out in this area and results were released to the public in July 2000. Also, under the NATMAP program, bedrock and surficial geological mapping and mineral deposit studies are being carried out by Geological Surveys Branch staff.

Nova Scotia Program Highlights 2000

Overview

Base funding for the Mineral and Energy Resources Division in 2000 was $1.99 million, a reduction of approximately 20% from the previous year. The budget reduction resulted in the loss of 10 permanent positions. These cuts are the Division's contribution to a commitment by the provincial government to implement a fiscal strategy that will eliminate deficit budgets and address Nova Scotia's accumulated debt. Despite the reductions, the Division carried out a diverse program of field and office-based projects to add new information to the geological database for the province and to stimulate and promote mineral development across Nova Scotia.

Program Highlights for 2000

Geological Mapping and Geochemistry

In 2000, the program of the Geological Mapping and Geochemistry Section featured:

- ✔ The continuation of 1:50 000-scale bedrock mapping in southwestern Nova Scotia. The project area is the only area in Nova Scotia that had not been mapped at detailed scale. The project, entering the 4th of a planned 5 years in 2001-02, has successfully identified new subdivisions and structures in the Meguma Group that have implications for these rocks elsewhere in Nova Scotia. As Nova Scotia's gold deposits are largely hosted by the Meguma Group, these advances in understanding its geology have implications for exploration for new deposits and re-evaluations of known deposits.
- ✔ The initiation of a collaborative mapping and mineral deposits project with the Geological Survey of Canada in south-central Cape Breton Island, with funding support from the federal government's Targeted Geoscience Initiative. Work on this 3-year project will include 1:50 000-scale bedrock mapping of the highly prospective, Carboniferous geology and a combination of mapping, shallow seismic studies and drilling to advance knowledge of the overlying, unconsolidated Cretaceous and Tertiary sediments. The Carboniferous rocks have potential to contain base metal, industrial mineral and hydrocarbon deposits, and the Cretaceous and Tertiary sediments have potential to host deposits of silica sand and kaolin.
- ✔ The initiation of a bedrock geochemistry project as part of a multi-disciplinary study of mercury contamination in Kejimkukjik National Park in southwestern Nova Scotia. This important study, funded in part by the federal government's Toxic Substances Research Initiative, is attempting to differentiate anthropogenic and natural sources of mercury that is affecting flora and fauna in the area. Nova Scotia's participation in this project has introduced consideration of natural (geologic) introduction of toxic substances, to a project team that had previously omitted geology as a potential source of the mercury.
- ✔ The release of a new Bedrock Geological Map of the Province of Nova Scotia. This map (Map ME 2000-1), published at 1:500 000 scale, replaces one printed in 1979, and which benefits substantially from the results of many mapping programs conducted across the province in the intervening years by the provincial and federal governments, industry and university researchers. It is available as a paper product from the Department of Natural Resources and as a free download from the Division's website (see below).

Mineral Resource Evaluation

The Mineral Resource Evaluation Section's program addresses the need for information about Nova Scotia's base and precious metal mineralization, coal and onshore hydrocarbon resources, and industrial minerals. Highlights of this program in 2000 included:

- ✔ The continuation of a major compilation of available bedrock geology and mineral deposits information for the well-known Meguma gold districts in Nova Scotia's Eastern Shore. The objectives of this project are to compile all pre-existing information on the gold districts and sur-

rounding areas, incorporate all relevant information into a digital database and map, and produce modern, site-specific deposit reports. This work proved timely in 2000 when renewed interest in the gold deposits surfaced, as evidenced by the re-opening of the Dufferin deposit, and new exploration on several other deposits.

- ✔ The continuation of a broad program to locate, characterize and document occurrences and deposits of industrial mineral commodities, including limestone and dolomite, gypsum and anhydrite, salt, barite, celestite, slate, building stone, quartz, and kaolin and silica sand. Much of this work in 2000 focused on Cape Breton Island, with links to the bedrock and surficial mapping components of the Targeted Geoscience Initiative project described above.
- ✔ The continuation of a program to document Nova Scotia's bedrock and surficial aggregate resources. Nova Scotia's abundance of deep-water, ice-free ports provides many opportunities to export aggregate to the eastern seaboard of the United States, where economic expansion and an aging transportation infrastructure have greatly increased demands for aggregate.

Geoscience Information Services

In 2000, the Geoscience Information Services Section continued to emphasize projects that will make more of the Minerals and Energy Branch's information available as digital products, and to develop applications that will allow users to access, manipulate and download geoscience data from the Internet. Clients may acquire digital products by purchasing disks or CDs, by accessing products on the Division's Public Access GIS system that is housed on computers in the Halifax library and the Stellarton core library, or as free downloads from the Division's Internet site at: www.gov.ns.ca/natr/meb. Highlights of this activity in 2000 included:

- ✔ The addition of three new digital products as downloadable files: the new Geological Map of the Province of Nova Scotia (Map ME 2000-1, 1:500 000 scale), an Enhanced Aeromagnetic and Digital Elevation Image of Eastern Nova Scotia, and a Claim, Mining Tract and Petroleum Reservation Grids for Claim Reference Maps. In 1999, over 5000 data sets were downloaded from the Division's website.
- ✔ The addition of the NovaScan geoscience bibliographic database to the Nova Scotia Provincial Library's government libraries catalogue database. The Provincial Library's database can be accessed and searched on the internet, at http://ncompasss.library.ns.ca/DNR/.

Mineral Promotion

The objectives of the Division's Mineral Promotion program are to facilitate exploration and development of the province's mineral resources through interactions with the private sector and governments, and to increase awareness and understanding among provincial departments and agencies and the public of the contributions of the mining industry to Nova Scotia. Highlights of these activities in 2000 include:

- ✔ Providing liaison between local holders of mineral rights for the former Dufferin gold mine and potential developers from abroad, leading to a decision to re-open the mine.
- ✔ Establishing strong communications linkages between the Division and provincial economic development departments and agencies, to explain the real and potential contributions of the mining industry to Nova Scotia's economy.

Prospectors Assistance Program

Nova Scotia's Prospectors Assistance Program (PAP) is funded by the Canada - Nova Scotia Economic Diversification Agreement. It has a value of $600 000 over four years, and will terminate on March 31, 2001. The program comprises three components:

- ✔ Introductory and advanced training courses for prospectors;
- ✔ Contributions of up to $5000 to assist property work; and,
- ✔ Marketing assistance to allow prospectors to promote their properties at trade shows.

In 1999-2000, the PAP presented 4 introductory training courses and 1 advanced training course, to a total of 75 people. Contributions totaling $140 000 were awarded to 28 prospectors. The marketing component of the program funded travel by 4 prospectors to the

Cordilleran Roundup in Vancouver and 12 prospectors to the annual meeting of the Prospectors and Developers Association of Canada in Toronto.

The program will have $190 000 for distribution in 2000-2001, its last year of operation.

Newfoundland & Labrador Program Highlights 2000

INTRODUCTION

The Geological Survey of Newfoundland and Labrador's (GSNL) program for 2000-2001 consisted of 25 projects having a total budget of $3.4-million. An additional $100 000 was allocated to the Survey from elsewhere in the Mines Branch, on a one-time basis, for a total operating budget in 2000-2001 of $3.5-million. All of the funding came from the provincial treasury and is much the same as that in the previous three years established by Program Review.

Exploration expenditures in the province during 2000 were projected to come in at $23 million. About $10 million of that is projected for Labrador, including approximately $8-million by Voisey's Bay Nickel. Approximately $13-million is projected for the Island, about the same as last year's actuals. However, since these projections were made, new exploration programs have been announced for both Labrador and Newfoundland, which could result in an extra $3 to 5-million more in exploration. Over 12 000 claims were staked in the province in 2000, approximately half on the Island and half in Labrador. They form part of the overall 48 000 claims in good standing.

PROGRAM HIGHLIGHTS

Bedrock Geology Surveys

Detailed 1:50 000-scale mapping of the Mesoproterozoic Nain Plutonic Suite was continued by Bruce Ryan. He has shown that the suite intrudes both Archean and Paleoproterozoic gneisses, and can be subdivided into twelve individual plutons. Mike Hamilton of the GSC is working with Bruce on the geochronology of these rocks.

Mapping of the south-central Grenville Province, at the Labrador-Québec border, was continued by Charles Gower at 1:100 000-scale. Paleoproterozoic to Mesoproterozoic orthogneisses contain zones of quartz-rich paragneiss that may be equivalent to the Wakeham Group to the south in Québec. Farther to the west in the Grenville, Don James of GSNL was joined by Leo Nadeau of the GSC in a 1:100 000-scale joint mapping program. Their coverage included the Paleoproterozoic magmatites and granitoids of the Wilson Lake Terrane, the late Paleoproterozoic anorthosites and gabbros of the Mealy Mountains Terrane, and the Mesoproterozoic granites and orthogneiss of the Mecatina Terrane. Leo leads the GSC's Targeted Geoscience Initiative (TGI) in the area entitled "*Tectonic framework and evolution of the eastern Grenville Province*".

Understanding the west Newfoundland Cambrian-Orodovician shelf sequences continued on a couple of fronts. Ian Knight and Doug Boyce spent a couple of weeks with American colleagues studying Ordovician gastropods, funded by the National Geographic Society. They then visited east Greenland at the invitation and sponsorship of the Geological Survey of Denmark and Greenland to examine platformal rocks there. This initiative is a continuation of ongoing collaboration between GSNL and the Greenland Survey.

The previous and current work of Knight and Boyce is a significant contribution to the "*Geological Bridges in Eastern Canada*" NATMAP project. Led by Denis Lavoie and Daniel Lebel of the GSC, the Newfoundland portion of the NATMAP involves structural and stratigraphic studies of the transported clastic sequences of the Taconic Humber Arm Allochthon.

The Middle Ordovician Wild Bight Group of Notre Dame Bay was the subject of 1:50 000-scale mapping by Brian O'Brien. Ophiolitic rocks of the South Lake Igneous Complex tectonically override volcanic rocks of the group. Brian is currently based at the British Columbia Geological Survey as part of a Visiting Scientist agreement between GSNL and BCGS.

Detailed mapping of the Neoproterozoic rocks of Avalon Peninsula was continued at 1:50 000 and 1:10 000 scales by Sean O'Brien. A previously defined conformable sequence of sedimentary and volcanic rocks with coeval

plutons has now been shown by field relationships and age dating (geochronology by Greg Dunning and John Ketchum at Memorial University) to represent volcanicity of widely different ages and compositions. Metallogenically specialized plutons have also been identified, characterized by hydrothermal alteration and copper and gold mineralization. Sean was also selected as the 2000 winner of the Provincial Geologists Medal - *see citation this volume.*

Significant progress was made during the year on the digital composite geology map of insular Newfoundland. This project is being managed by Steve Colman-Sadd with the assistance of Loretta Crisby-Whittle. Using the best available published maps, they now have 55% of the Island completed. Eventually, using Steve's GeoLegend software, customized maps for any area and scale can be produced depending on client preferences.

Surficial Geology Surveys

A till-geochemistry program was completed by Martin Batterson and Dave Taylor over the Bonavista Peninsula during the 2000 field season. Surficial deposits and ice-flow indicators were also mapped. Indications are that two ice centres, one in central Newfoundland and a local one on the peninsula, affected the area. Geochemical analyses will be available in 2001.

Jerry Ricketts continued his surficial-aggregate studies, this year in the Codroy area of western Newfoundland and the eastern part of the Avalon Peninsula. In the west, Jerry was delineating the disposition of aggregate deposits vis-à-vis other conflicting land uses, to ensure an adequate supply for development use. On the Avalon, strong demand from St. John's and environs makes the identification of new sources crucial. New deposits were mapped in both regions.

Mineral Investigations

A new metallogenic study of the Neoproterozoic Burin Group on the Burin Peninsula was carried out by Cyril O'Driscoll. The group contains mafic volcanic and ultramafic rocks, and has potential for gold, cobalt, copper and nickel mineralization. Cyril's mapping has separated the ultramafic rocks into a 20 kilometre zone of fault-bounded lenses, interpreted as slivers of ophiolite. Gold showings in the area assay up to 20 grams per tonne.

GSNL also supported an M.Sc. thesis study by Memorial University student and former Survey employee Jeff Pollock in the Tally Pond belt of central Newfoundland (The project is also supported by the companies developing the Duck Pond copper-zinc project). The study will endeavour to geochemically distinguished key volcanic units that contain massive sulphides versus those that are barren. This project is also being supported by the GSC under its second TGI project in the province entitled "*Geology of the Iapetus Suture Zone, Red Indian Line*". Led by Cees van Staal, the TGI will focus on the tectonic setting of the fundamental suture zone of the Appalachian Orogen in central Newfoundland, a very important region of high mineral potential.

The Survey also released four mineral-commodity maps throughout the year. These are produced from our Mineral Occurrence Data Systems (MODS), and the four are: epigenetic gold; copper; zinc-lead; and Mississippi Valley-type lead-zinc. Three mineral-commodity brochures were also published: zinc and lead; nickel; copper. These are short summaries of the mineralizing environments and the exploration potential for these commodities in the province.

Open House 2000

The 24th Annual Review of Activities of the Department of Mines and Energy took place on November 2, 2000. Approximately 200 delegates attended the meeting, as well as the CIM Newfoundland Branch conference that followed the Open House. Minister Paul Dicks opened the review session and invited attendees to visit the thirty-eight posters on projects by the GSNL and the GSC in the province. GSC managers, as well as GSC research scientists, were on hand to meet with GSNL personnel and discuss results with clients. Technical presentations included talks on the Bridges NATMAP in Newfoundland, the metallogeny of the Burin Group, and the Nain Plutonic Suite. GSNL's Debbie Downey also received CIM's Certificate of Appreciation for her more than 20 years of support for the Newfoundland Branch.

Yukon Program Highlights 2000

Introduction

Now in its fifth year, the Yukon Geology Program is a *de facto* Yukon Geological Survey consisting of two integrated and jointly managed offices with different administrative structures. Federal funding is provided through the Exploration and Geological Services Division of the Department of Indian Affairs and Northern Development (DIAND), while Territorial and cost-shared (YTG/DIAND) funding comes through the Mineral Resources Branch of the Department of Economic Development (YTG). The Geological Survey of Canada (GSC) also maintains an office with the Program.

The Yukon Geology Program is an informal and temporary organization that will be transformed into a Yukon Geological Survey when the responsibilities of the Northern Affairs Program are devolved to YTG. Negotiations have met delays, and the target date for devolution has once again been moved ahead one year to April 1, 2002. The agreement in principal for the transfer is near completion and all parties expect negotiations to be successful.

During the past year, the Program benefited greatly from continued staff stability. YTG hired two GIS technicians, Gord Nevin and Garry Stronghill. Tammy Allen was appointed to a two year term position to work on the Central Foreland NATMAP Project in LaBiche map area.

Exploration activity was down again this year with spending at a recent low of about $8.8 million and new claim staking is down significantly. This year, however, saw a broader range of exploration targets than recent years. Targets included magmatic nickel/ copper PGE deposits in the Kluane Ranges, VMS deposits in the Finlayson Lake District mainly, and gold deposits throughout the Tintina Gold Belt.

Program Highlights

Fieldwork

The Yukon Geology Program continued to commit substantial resources to a joint Geological Survey of Canada - British Columbia Geological Survey Branch - Yukon Geology Program initiative, the Ancient Pacific Margin NATMAP (National Mapping Program) project.

This project is a multidisciplinary effort to better understand Yukon-Tanana and Kootenay terranes, arguably the least well understood parts of the North American Cordillera.

The Yukon Geology Program contribution includes the ongoing work of Don Murphy in the Finlayson Lake Massive Sulphide District, fieldwork begun last year by Maurice Colpron in the Glenlyon area, mapping by Charlie Roots of the western half of Wolf Lake map area and the northern half of Jennings River map area in B.C. in partnership with Joanne Nelson and Mitch Mihalynuk of the B.C. Geological Survey Branch., and surficial studies by Grant Lowey in the Stewart River map area in conjunction with regional surficial studies by Lionel Jackson of the GSC.

Other parts of the Ancient Pacific Margin NATMAP include bedrock mapping of Stewart River map area in Yukon by Steve Gordey of the GSC, in southern B.C., regional mapping by Bob Thompson of the GSC, and in east-central Alaska, mapping by David Szumigala of the Alaska State Geological Survey, and mineral deposit studies by Cynthia Dusel-Bacon.

Participation by numerous university researchers, graduate students and other specialists has greatly added to the depth and complexity of the project. In Yukon, these include lithogeochemical studies in the Finlayson Lake area by Steve Piercey and Jim Mortenson of The University of British Columbia and mineral deposit studies by Suzanne Paradis of the

GSC. Regular workshops and field trips are one of the main benefits of such a large and diverse project. This summer Jim Mortensen led a field trip along the Top of the World Highway west of Dawson and into Alaska.

This year, the Project received a substantial boost through additional funding provided by NRCan's Targeted Geoscience Initiative. The extra funds were used to conduct an airborne multispectral and magnetometer survey across the Yukon-Tanana Terrane in Stewart River map area where bedrock exposure is especially poor. Preliminary approval was also given for TGI funding over the following two years. Plans for 2001 include accelerated regional mapping of Finalyson Lake map area north of the Tintina Fault, a till geochemical survey in the northern portion of the area between the Anvil and the Finlayson Lake Massive Sulphide Districts, as well as additional geophysical surveys in the Stewart River map area. The proposal for 2002 includes accelerated mapping of the Yukon-Tanana portion of Glenlyon and McQuesten map areas and continued geophysical surveys in Stewart River map area.

Another major effort by the YGP is to synthesize and enhance the geological database of the Anvil District. The Faro Mine remains closed for the foreseeable future, but the possibility remains for renewed exploration and mining. Lee Pigage has completed bedrock mapping and expects to release a complete set of 11 geological compilation maps of the district at 1:25 000 scale by the spring of 2001. Jeff Bond has completed surficial mapping and a till geochemical survey and expects to release 11 final maps and a bulletin in the spring of 2001.

In order to accommodate increasing interest from YTG and industry in hydrocarbon-related geoscience, Tammy Allen and Lee Pigage joined GSC Calgary staff and university researchers on the Central Forelands NATMAP Project in LaBiche map area in southeast Yukon. The three year project will include mapping of selected areas at 1:50 000 scale and and new maps of the Labiche and Fort Liard areas at 1:250 000 scale.

Craig Hart continued his studies of Yukon gold occurrences; splitting his time between those related to the Tombstone intrusive suite northeast of the Tintina Fault, and those in the Dawson Range along trend from the Pogo Deposit in Alaska. Craig also assisted some of the students who received support from the YGP to study various aspects of Yukon gold deposits. These included Mark Lindsay, Julian Stephans, under the supervision of Tim Baker at James Cook University and John Mair (University of Western Australia); Erin Marsh and Seth Mueller under the supervision of Rich Goldfarb at the U. S. Geological Survey; and S. Heffernan and Kelly Eamon under the supervison of J.K. Mortensen at The University of British Columbia. Bedrock geology maps of the Dawson Range copper-gold belt, compiled from earlier mapping with the aid of recent geophysical surveys, are expected to be released in the spring of 2001.

Bill Lebarge and Mark Nowasad continued their studies of the relationship between sedimentology, grain size distribution, and water quality of effluent from placer deposits. Data gathered from this study should assist with the review of the Yukon Placer Authorization on 2001.

Julie Hunt who is now working half time, is nearing completion of her bulletin on Yukon Volcanogenic Massive Sulphide Deposits.

Grant Lowey and Darrel Long undertook a sedimentological study of Cretaceous sedimentary rocks near Ross River where dinosaur tracks were recently discovered.

External Support

Derek Thorkelson at Simon Fraser University continued his research on Proterozoic sequences and mineral deposits in the Wernecke Mountains with a limited study of the Bear River Dykes.

John Westgate at the University of Toronto continued Tephrachronology studies in the Klondike area.

Robert Creaser and Dave Selby at the University of Alberta began a project to determine the feasibility of using Rhenium/Osmium systematics to determine the age of molybdenum in Yukon mineral deposits.

In order to make Regional Stream Geochemical data from the National Geochemical Reconnaissance Program more accessible, Peter Friske with the Geological Survey of Canada in Ottawa was funded to produce a template for display of existing open file data in PDF Format. We expect to begin releasing existing RGS data as PDF files in the new year.

Industry Liaison and Support

Mike Burke and Bill Lebarge, our main links to the exploration industry, continued to monitor Yukon hardrock and placer mining and mineral exploration activity, visit active properties, review reports for assessment credit, and maintain the assessment report library.

Yukon Minfile

Yukon MINFILE, another mainstay of the Yukon Geology Program, is maintained by Robert Deklerk. We have completed an upgrade from Microsoft Access Version 2 to Access 97 with major revision and simplification of the database structure. The updated digital version with data revised to 1998, will be released on CD-ROM in the spring of 2001. New locations maps produced in Arcview will accompany the release. The text version of MINFILE is available on our Website and in hard copy through Exploration and Geological Services Division.

Yukon Geoprocess File

The Yukon Geoprocess File, under the direction of Diane Emond, is an inventory of information on geological process and terrain hazards, including 1:250 000 scale maps showing permafrost, landslides, recent volcanic rocks, structural geology, and seismic events and also includes references and summaries of bedrock and surficial geology. The Geoprocess File is intended as a planning aid for development activities and is available for most areas south of 66° latitude. The maps will soon be available in colour, on a single compact disk.

H. S. Bostock Core Library

The H. S. Bostock Core library is maintained by Mike Burke and Ken Galambos. The facility contains about 128 000 metres of diamond drill core from about 200 Yukon mineral occurrences. Confidentiality of material is determined on the same basis as mineral assessment reports. Confidential core can be viewed with a letter of release from the owner. Rocks saws and other rock preparation equipment are available to the public.

Mineral Resource Assessments

The Yukon Mineral Resources Branch is responding to an increasing need for geological and metallogenic information to assist resolution of land use issues and conflicts. Some of the pressures have come from native land claims negotiations, and localized land use conflicts such as one within the city limits of Whitehorse, but most important is the priority of the Yukon Government to implement the Yukon Protected Areas Strategy. The goal of the Yukon Protected Area Strategy is protection and withdrawal of representative land from industrial activity in all 23 ecoregions in the Yukon.

A regional mineral potential exercise was conducted in the spring of 1999 for Northern Yukon, winter 2000 for Cassiar Terrane and eastern Yukon-Tanana Terrane, and Fall 2000 for Selwyn Basin. Compilation is ongoing for the next regional assessment to address Stikine and Cache Creek Terranes. The assessment is planned for Spring 2001.

The methodology used includes the use of expert panels to estimate the probability of discovering new mineral deposits in geological tracts, processing of estimations through the Monte Carlo simulator, and generation of maps displaying the relative mineral potential of the tracts.

Field-based mineral deposit model studies were conducted in the Bonnet Plume, Frances Lake, and La Biche areas in anticipation of future land use issues. Geological mapping, prospecting, and sampling in anticipation of detailed mineral resource assessments was also carried out in the Richardson Mountains, McArthur Range, and Nordenskiold River area.

Staff thoroughly review Land Claim selections and provide technical information to territorial Land Claim negotiators. Comment is provided on mineral potential, exploration history, mineral land tenure and access. We also and update and distribute the Yukon Land Status Map.

Yukon Mining Incentive Program

The Yukon Government provides grants for grassroots exploration and initial development of properties. This year a total of $761 000 was distributed to 54 prospectors under the supervision of Ken Galambos.

Northwest Territories Program Highlights 2000

INTRODUCTION

The NWT Geology program is jointly delivered by the federal Department of Indian Affairs and Northern Development's NWT Geology Division, and the Territorial Department of Resources, Wildlife and Economic Development's Minerals, Oil and Gas Division. DIAND is responsible for monitoring mineral exploration activity and reviewing assessment work, whereas RWED carries out policy analysis and delivers prospector training and grubstake programs. Both departments jointly deliver a geoscience program through the shared C.S. Lord Northern Geoscience Centre.

GEOSCIENCE PROGRAM

The C.S. Lord Northern Geoscience Centre participated in three major geoscience projects in 2000. The first project involved bedrock mapping in the southwestern Slave Province (Snare River area). The four-year project is in its third year, and is focussing on upgrading existing bedrock data and documenting the tectonothermal evolution of the area. 1:50 000-scale bedrock maps are released annually, and final 1:100 000-scale maps and an accompanying digital atlas will be released in 2002 following completion of the project.

The second project, the Yellowknife EXTECH III project, began its second year with scientific and logistical coordination provided through the C.S. Lord Centre. EXTECH III is a collaborative project between the Geological Survey of Canada (GSC), C.S. Lord Northern Geoscience Centre, several universities and industry partners, and it benefited this year from funding through the GSC's Targeted Geoscience Initiative (TGI). EXTECH III's main objective is to provide an improved exploration model for Archean shear-zone hosted gold deposits, by examining the stratigraphic, structural, metamorphic, and chemical characteristics of deposits in the Yellowknife area.

A third, new, project was initiated this year in the southeastern Slave Province (Walmsley Lake area), in collaboration the GSC. This is a 3-year study aimed at upgrading bedrock and surficial mapping, examining the petrogenesis of volcanic rocks, and quantifying the P-T history of the area. The GSC component of the study, funded through TGI, involves regional geochronology, isotopic fingerprinting of crustal rocks, and geophysical studies that target the upper mantle beneath this part of the Slave Province.

In addition to these major studies, the Centre carried out a number of oil and gas-related projects aimed at educating the public and attracting investment to the north. These included development of a video on the proposed gas pipeline, and creation of posters highlighting the geology and petroleum resources of the NWT. In the fall, the Centre hired an oil and gas project geologist, who will initiate a number of studies in northern basins, in collaboration with GSC-Calgary, over the next year.

Funding was acquired this fiscal year to support diamond-related research. The diamond geologist is carrying out a number of projects, including compilation of picking results from till sampling programs filed for assessment credit by exploration companies, a study of alkaline rocks in the NWT, and collaboration with the GSC on a study of the Lac de Gras kimberlite field.

A digital atlas of the Yathkyed greenstone belt and a digital compilation map of the Pistol Bay area were completed during the 2000-2001 fiscal year. Both were pre-division projects carried out in Nunavut by C.S. Lord staff.

DIAND NWT GEOLOGY DIVISION

The Geology Division tracked exploration and mining activity in the NWT, monitoring progress on exploration programs and carrying out 7 site visits. Assessment work, worth over $13.5 million, was filed with the department reviewed by Division staff, and over 2000 requests for information were filled. In addition, sales of open files and assessment reports worth $15 600 were recorded by the Division.

Progress on the NORMIN.DB, NWT and Nunavut's on-line database of mineral occurrences and references received $320 000 in funding from the federal Government On Line (GOL) initiative, allowing data entry to continue and a number of upgrades to the reference side of the database to be made. The upgrades will ensure that metadata on NWT and Nunavut reference material meet the standards being defined nationally for the Canadian Geoscience Knowledge Network.

RWED MINERALS OIL AND GAS DIVISION

The Minerals, Oil and Gas Division of RWED granted 16 grubstakes, worth $75 000, in 2000. Individual grants ranged in value from $3500 to $6000. In addition, 2 Prospector Training Courses and 1 Prospector Workshop were held, and a number of outreach activities were undertaken, such as participation in the Great Northern Fossil Hunt, classroom visits, career fairs, and community workshops to discuss resource exploration and assessments in the context of the NWT's Protected Areas Strategy.

RWED maintains a number of websites designed to link viewers with current information on oil and gas in the Mackenzie Valley. In addition, the Division carried out some preliminary research on petroleum resource assessments, and created an inventory of oil and gas-related information for the Fort Providence region. The 1995 *"Guide to Mineral Deposits of the NWT"* was updated and printed for distribution in time for the 2001 Cordilleran RoundUp.

EXPLORATION/MINING ACTIVITY

Diamond exploration continued to lead exploration expenditures in 2000, with 25 new kimberlite discoveries from 29 separate exploration projects. BHP bulk sampled four pipes this year, and continued exploration drilling on their property. De Beers and joint venture partner Mountain Province Diamonds Inc. evaluated the results of a 1999 bulk sampling program at Kennady Lake, and determined that the modelled rate of return was below the cut-off rate agreed upon. Other exploration involved airborne and follow-up ground geophysics, till sampling, and exploration drilling, primarily within the Slave Geological Province. De Beers Canada took over Winspear Resources in August 2000, and now owns the majority share with joint venture partner Aber Resources Limited. Before the takeover, Winspear had announced plans to develop Snap Lake; De Beers is currently re-evaluating the diamond deposit.

Exploration for metals was carried out on 23 different projects. Highlights include in-fill drilling for resource calculations on the NICO Co-Au-Bi and Howard's Pass Zn-Pb deposits, and exploration Sunrise VMS deposit. Exploration of several Au occurrences focussed on prospecting, trenching, and geophysical/geochemical surveying. Ni-PGE exploration increased in 2000 relative to the previous year. An 1800-metre hole was drilled into the centre of the Darnley Bay gravity anomaly with the hope of intersecting significant Ni +/- PGE mineralization, but the hole intersected only Cretaceous and Cambrian sedimentary rocks. Other Ni/PGE exploration included ground geophysics and lithogeochemical sampling.

Three mines continued to operate in the NWT in 2000. Miramar Mining Corporation continued to operate the Con and Giant gold mines in Yellowknife, and produced 2444 kilograms gold in the first three quarters of the year. BHP's EKATI diamond mine produced 1.35 million carats in the first half of 2000. Permitting for a fourth mine - Diavik Diamond Mine - was completed this year, and production is expected by 2003.

GEOSCIENCE FORUM 2000

The 28th annual Yellowknife Geoscience Forum saw record attendance in 2000, with over 550 delegates registered. Technical presentations were split into two concurrent sessions over three days, which helped accommodate the large number of speakers, but created conflicts for some. Oral presentations were heard on government geoscience in NWT and Nunavut, oil and gas exploration, diamonds, metallic minerals exploration, environmental and regulatory issues, and the Yellowknife EXTECH project. In addition, displays featured a new CD ROM Guide to Legislation,

core displays, a prospector room, commercial booths and technical posters.

The Forum was followed by a Needs Workshop hosted by the C.S. Lord Centre and Geological Survey of Canada. The aim of the workshop was to identify geoscience priorities for the NWT over the next three to five years by seeking input from clients. These priorities will serve to aid program planning in the short to medium term for the two agencies.

Nunavut Program Highlights 2000

The Canada-Nunavut Geoscience Office (C-NGO) has completed its first full year of operation in Canada's newest territory. The C-NGO is a collaborative venture between the Government of Nunavut's Department of Sustainable Development, DIAND and NRCan that responds to these agencies' common geoscience program interests. The C-NGO is now fully staffed, and an inaugural field season of activities has been completed in priority areas across Nunavut. Much of the fieldwork undertaken by the C-NGO was performed in collaboration with the Geological Survey of Canada.

The administration and regulation of lands and resources in Nunavut remains with DIAND, but as of September 2000, is managed through a new office in Iqaluit. The federal government remains committed to transferring these jurisdictional responsibilities to the Government of Nunavut, but a timetable has yet to be established.

The C-NGO is currently operating a number of geoscience projects, ranging from regional, multi-disciplinary mapping initiatives, field-based thematic studies, to office-based outreach projects. Some of the initial projects have recently been completed, while others are scheduled to operate for up to three additional years. Briefly, these include:

Regional Integrated Mapping

Committee Bay area, central mainland

Archean greenstones of the Prince Albert Group and surrounding metaplutonic rocks on parts of four NTS 1:250 000-scale map sheets are the subject of a multi-disciplinary bedrock and surficial mapping investigation. The region has elevated potential for gold and base metal mineralization. Following fieldwork in the summer of 2000, the bedrock geology of NTS 56K will be published at 1:100 000 early in 2001. Several reports outlining the preliminary results of this work are reported in the GSC's 2001 Current Research. One Ph.D. and two M.Sc. studies of aspects of the bedrock geology are presently being supported by the project; two additional M.Sc. students will initiate surficial mapping-based theses in the summer of 2001. A TGI-funded regional aeromagnetic survey, with 400-metre line spacing, was launched in the summer of 2000 and will be completed in the spring of 2001.

Personnel from the GSC will become involved in the field component of this project during the 2001 field season, and a drift-prospecting program has been proposed for funding under TGI.

Central Baffin Island

The Archean rocks of the northeastern Rae craton and the Paleoproterozoic rocks of the Piling Group that cover the continent's southern margin will be mapped on parts of four NTS 1:250 000-scale map sheets in collaboration with the GSC. Indications of anomalous values of a variety of commodities, including Zn, Ni + PGEs and Au, are present in the area. The results of 2000 fieldwork will be published as a series of four maps at a scale of 1:100 000 early in 2001. Two doctoral and two M.Sc. studies are presently being supported by the project. In addition to the systematic regional mapping, a variety of thematic surveys, such as a teleseismic and gamma spectrometry are being undertaken

Thematic Studies

Arctic Islands Zinc

In collaboration with GSC-Calgary, and with the support of Cominco and Noranda, the first year of a planned 2-year study that will establish the regional controls on zinc-lead mineralization in the Polaris District has been completed. Preliminary results of this work are reported in the GSC's 2001 Current Research. Two M.Sc. students are undertaking detailed structural investigations, and geochemical and isotopic analytical programs are underway.

Archean Gold, Meadowbank Area

Fieldwork for an investigation of the structural setting and metallogenesis of gold in the Meadowbank area of the central mainland was undertaken in the summer of 2000. An overview of the field results is presented in the GSC's 2001 Current Research, analytical work on the project is ongoing, and completion of the project is expected in mid-2001.

North Baffin Zinc

In collaboration with Breakwater Resources, operators of the Nanisivik Mine (Zn-Ag-Pb), a project to establish the regional controls on mineralization has been initiated. Compilation of surface geology at 1:50 000 scale and alteration studies are ongoing, and 3-D modelling of the geologic setting of mineralization and a detailed stratigraphic investigation to determine possible primary controls on mineralization will be initiated in the spring and summer of 2001, respectively.

Western Churchill NATMAP wrap-up

Support is ongoing for the completion of several sedimentological, geochronological and tectonic syntheses of parts of the Western Churchill NATMAP project area. These results will be presented as contributions to the refereed literature, as well as at various meetings and workshops throughout the year. This support is scheduled to conclude in December 2001.

Archean Gold, Hope Bay greenstone belt

Fieldwork will commence this summer to investigate the tectonic setting and conditions of formation of several gold deposits in the Hope Bay greenstone belt in the northern Slave craton, north of Yellowknife. This work will be undertaken in collaboration with the Hope Bay Gold-Miramar Mining joint venture project in the belt.

Outreach Projects

Climate Change in Nunavut

A poster entitled "*Degrees of Change: Climate Change in Nunavut*" has recently been completed as part of a national, Climate Change Action Fund sponsored program to raise awareness of the impacts of climatic change on everyday life. The Nunavut poster combines Inuit traditional knowledge and western scientific ideas to relate information to a wide range of users. As the effects of this change have already been widely noted by the public, there has been great interest in this project.

GEOSCAPE Nunavut

As part of the national GEOSCAPE project, the C-NGO has undertaken work on an initiative to relate the geology of the territory to its citizens. In contrast to other GEOSCAPE posters that focus on a single municipal area, ours will illustrate features from across Nunavut. We anticipate completion of a first draft of the poster before the 2001 field season, with stakeholder consultation to occur during the summer, and completion of the poster prior to the end of 2001.

Compilation of Bedrock Geoscience Knowledge

Work has begun on an NADM-compliant bedrock geoscience database that will be the foundation for a new 1:1 000 000-scale digital compilation of existing knowledge. The database is being populated using existing paper-based datasets as well as recently acquired digital information. The first product will be a new synthesis of the geology of Baffin Island, in traditional paper as well as digital formats. We are working with the national CGKN initiative to ensure that this fundamental dataset will be web-enabled as expeditiously as possible.

Digital field data collection using Palm handheld computers

In response to our need to manage data collection in large field crews, we have implemented an NADM-compliant data capture system that operates on Palm handheld comput-

ers. The system has a very fast learning curve, is robust on the outcrop, and can easily customized to suit a variety of bedrock and surficial mapping applications. Data are downloaded into a database in the field camp on a daily basis, and can be visualized immediately using ArcView GIS. A brief overview of the system is reported in the GSC's 2001 Current Research; electronic copies of the data collection forms are available from the C-NGO.

GIS Internship Program

A recent stakeholder workshop hosted by the C-NGO has determined that there is an acute need for skilled GIS technicians to help numerous Nunavut organizations satisfy resource management obligations under the Nunavut Land Claims Agreement. In response, the C-NGO is taking the lead on implementation of a collaborative training strategy that targets graduates of the Environmental Technology Program at Arctic College in Iqaluit. We have developed a program of 9-12 month internships for Nunavut youth that will help to build GIS skills and consequently develop local capacity in this important field. We anticipate that all four Intern positions will be filled prior to the 2001 field season.

Survey of Hard Rock Drill Core Programs 1999-2000

SURVEY OF HARD ROCK DRILL CORE PROGRAM IN CANADA

Fiscal Year 1999-2000

	B.C.[1]	ALBERTA	SASK.	MAN.	ONT.	QUEBEC	N.B.	N.S.	NFLD.	P.E.I.[3]	YUKON	NWT	NUNAVUT[4]
No. of Facilities	0	1	2	4	5	2	3	3	6	1	1	1	n/a
Use of Facilities Person Days (pd); Visits (v)	0	80	81	4	157	0	150-200 pd	250	398	0	50 v	0	n/a
Staff Person Days Worked	0	100	115	6	200	3	702	620	640	0	150	0	n/a
Capital Cost 1999-2000	$0	$4,500	$0	$0	$0	$0	$12,000	$0	$0	$500	$30,000	$0	n/a
Operating Cost	0	30	19.2	3	23.5	36 000	4.5	15	27.7	0	10	7	n/a
Core Collected and or Delivery	0	2 500	2 457.1	1 261	17 295	NIL	42 000	2 145	38 349	2 500	124 400	42 600	n/a
Core Reduction*	NIL	NIL	NIL	NIL	NIL	Facility to close summer 2000	NIL	NIL	NIL	NIL	NIL	NIL	n/a
Total Core in Storage (from all years in metres)	0	42 300	85 081[2]	226 493	1 657 942	139 924	650 600	660 250	977 786	3 670	124 400	0	n/a
Total Exploration Drilling	140 000	10 000	92 767	83 292	543 376	350 000	15 000	13 800	116 000	0	10 579	100 000	n/a

* Over last year.

1 B.C. has no facilities for hard rock core.

2 Saskatchewan: Figures from the Petroleum & Natural Gas Collection subsurface Laboratory, Regina which stores stratigraphic Athabasca Group core, are not included.

3 P.E.I. has no core storage program.

4 Nunavut has no core storage program

COOPERATIVE GEOLOGICAL MAPPING STRATEGIES ACROSS CANADA

1. INTRODUCTION

The Action Agenda for Mining in Canada, endorsed by federal, provincial and territorial Mines Ministers following their 56th annual meeting, recognized the key role of geoscience knowledge in making Canada a pre-eminent global destination for investment dollars. Ministers undertook to consider strategies to achieve adequate funding levels and to work to address a 10-year goal to substantially improve the geoscience knowledge base across Canada. The present document, prepared by the National Geological Surveys Committee in consultation with the industry, responds to the Ministers' direction to develop cooperative mapping strategies for Canada.

2. BACKGROUND

The publicly accessible store of reliable geoscience knowledge across Canada is widely acknowledged as a key competitive advantage in attracting investment in the increasingly competitive global mineral and petroleum exploration market. However, the mineral mining and exploration and petroleum industries have argued that this relative competitive advantage has been put at risk for a number of reasons, including:

A) There remain significant areas, particularly in northern and remote regions in Canada, for which geological, geophysical or geochemical maps are either non-existent or at such a coarse scale that they provide little guidance to exploration.

B) The usefulness of previously acquired data is gradually eroded by advances in scientific understanding and the introduction of new, more precise survey technologies.

C) Principal competing nations for exploration investment are rapidly upgrading their own stores of geoscience knowledge.

The state of the geoscience knowledge base was examined at a multi-stakeholder workshop held in 1997 in conjunction with the 54th Mines Ministers' Conference in St. John's, Newfoundland. The workshop report drew particular attention to the protracted decline in the cumulative investment in geological survey activities by governments.

In response, industry and the Intergovernmental Working Group on the Mineral Industry (IGWG) established an industry-led task force to investigate alternative funding arrangements for geological surveys. The task force report presented to the 55th Mines Ministers' Conference in

Calgary, Alberta, concluded that geological survey activities are fundamentally a public good that should be funded by governments through either appropriation or a dedicated revenue stream from existing taxes, fees and levies collected from the industry.

IGWG then asked the task force for an assessment of the level of funding that would be required to sustain the competitive advantage afforded by the geoscience knowledge base in Canada. Recognizing that complete coverage of the Canadian landmass at the optimum scale is not a realistic short-term goal, the task force asked each jurisdiction to identify the key gaps in geological, geophysical and geochemical map coverage that should be addressed over a 10-year time horizon. The findings were presented at the 56th Mines Ministers' Conference held in Charlottetown, PEI, in September 1999. The task force estimated that a total incremental[1] investment of $363 million would be required over the next 10 years to fill priority gaps in surface map coverage. The task force also estimated that the cost of providing the subsurface mapping needed to support hydrocarbon exploration would total $240 million over 20 years.

3. PRINCIPLES

The proposed Cooperative Geological Mapping Strategies are based on the following principles:

3.1 The strategies respect the jurisdictional responsibilities of each order of government in all provinces and territories of Canada.

3.2 They will address the geoscience priorities in each jurisdiction.

3.3 Their implementation will be compatible with geoscience agreements between provinces or territories and the Geological Survey of Canada (GSC) where they exist, or will flow from specific project agreements between provinces, territories and/or the GSC.

3.4 Joint funding and delivery mechanisms will be sufficiently flexible to allow all jurisdictions to participate.

3.5 All knowledge generated as a result of projects carried out under the strategies will become the joint property of and be fully available to the GSC and the provincial or territorial geological survey that participated in the projects. The parties will jointly make this knowledge available to clients in a timely, easily accessible and seamless fashion, through appropriate mechanisms.

4. GOAL AND OBJECTIVES

The goal of the Cooperative Geological Mapping Strategies is to ensure that enhancing the geoscience knowledge base will play a key role in re-establishing Canada as a pre-eminent global destination for exploration dollars and in providing a sound basis for resource stewardship. To achieve the goal by the year 2011, implementation of the cooperative geological mapping strategies must begin in April 2001.

The economic objectives of the Cooperative Geological Mapping Strategies are:

4.1 Increase investment in mineral and energy exploration;

4.2 Stimulate new discoveries;

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1 *That is, the difference between the total cost of achieving the desired level of map coverage and the level of funding currently devoted to such mapping activities, summed across all jurisdictions.*

4.3 Identify new, previously unrecognized resources in mature areas; and,

4.4 Help ensure sustainable development.

Thus, the strategies will support resource stewardship and help create wealth, stimulate economic activity and job creation, and generate tax revenue. At the same time, they will support sustainable resource management. The projected impacts of the strategies are summarized in Annex A.

The associated technical objectives are:

4.5 Fill important gaps in subsurface and surface geological map coverage across Canada. This includes:

4.5.1 Mapping areas that have not been mapped at all, or that have not been mapped at a satisfactory scale;

4.5.2 Incorporating advances in the understanding of fundamental geological processes; and,

4.5.3 Repeating geophysical surveys to modern standards.

4.6 Present the results to clients (prospectors, exploration and mining companies, oil and gas producers, provincial, territorial and federal government departments) in a format that makes them easy to understand and use, through appropriate mechanisms.

5. COOPERATIVE STRATEGIES

A cooperative geological mapping strategy will be developed for each participating province or territory. These strategies will be delivered through a series of collaborative projects undertaken by the provincial or territorial geological survey organizations and the GSC in a manner that respects the jurisdiction of each order of government, and in agreement with the principles outlined in Section 3. The collaboration can involve any of the provincial, territorial and federal geological survey organizations.

In general, the activities of the provincial and territorial geological survey organizations will be specific to the economic development and resource management of their own jurisdictions. These will be carried out at a scale appropriate to addressing provincial or territorial responsibilities, and contribute to a systematic description of the geology of the provinces and territories, including their mineral, energy and groundwater resource endowment. Provincial and territorial geological survey organizations will also cooperate in mapping border regions when appropriate.

In general, the activities of the GSC will be thematically based, and Canada-wide or broadly regional in scope and significance. They may include aspects of specialized research, technology application and information management not contained in the programs of all the provincial and territorial survey organizations.

Specific delivery strategies are outlined in Annex B.

Implementation of the Cooperative Geological Mapping Strategies is predicated on the availability of new funding, and it is envisaged that both orders of government will make equal contributions. While different funding ratios may be negotiated, both orders of government will provide new funding where possible.

It is recognized that the geoscience needs and budget priorities are different in each jurisdiction, and that ministers are not yet in a position to indicate what level of funding support might be accorded to the Cooperative Geological Mapping Strategies. It is proposed that, as a first step, the Minister of Natural Resources Canada determine the total amount of federal funds that would be

available for investment in the strategies. The provincial and territorial ministers would then, in turn, indicate how much their respective jurisdiction is prepared to invest. The final allocation of funding to the Cooperative Geological Mapping Strategies in each jurisdiction would then be determined through bilateral negotiations. The allocation of budgets to projects within each jurisdiction would be in accordance with the governance mechanisms outlined below.

6. GOVERNANCE

Priorities for collaborative projects will be established and projects will be carried out in accordance with existing agreements and practices. The federal-provincial/territorial Cooperation Committee in each province and territory, or such committee as may be acceptable to the Geological Survey of Canada and the provincial/territorial geological survey, will be responsible for program management within its province or territory. These Cooperation Committees are advised by Technical Advisory Committees that have strong industry representation. Where study regions cross provincial or territorial boundaries, the Cooperation Committees involved will jointly manage cross-boundary projects and ensure that coordination takes place.

The National Geological Surveys Committee (NGSC) will coordinate the implementation of the Cooperative Geological Mapping Strategies at the Canada-wide level. An NGSC Advisory Board, consisting of representatives from the Technical Advisory Committees in each jurisdiction and from academia, will review the overall implementation of the strategies in terms of alignment with the goals, synergy, and Canada-wide priorities, and will make recommendations accordingly to the NGSC. Where appropriate, the NGSC will recommend to the federal-provincial/territorial Cooperation Committees or their equivalents adjustments that improve coordination of the program. The Cooperation Committees will take these recommendations into account when allocating resources to projects and will assume responsibility for execution of the program within their province or territory.

A Coordinator will be appointed who is in charge of:

- ✔ Monitoring the strategies developed across Canada (standards, networks, project interaction and complementarity, reporting to ministers, *etc.*);
- ✔ Promoting the program to federal, provincial and territorial agencies to support their marketing to investors and the minerals and petroleum industry across Canada and globally;
- ✔ Monitoring progress;
- ✔ Reporting;
- ✔ Supporting the NGSC in all of its duties related to the Cooperative Geological Mapping Strategies.

The Coordinator will be supported by a Secretariat. Both the Program Coordinator and the Secretariat will be provided by Natural Resources Canada and will report to the NGSC.

7. EVALUATION FRAMEWORK

Each federal/provincial Cooperation Committee will review progress annually. The results of the reviews will be presented to the NGSC. A report will be presented periodically to the Mines Ministers' Conference.

Impact studies will be commissioned after five years and at the completion of implementation.

ANTICIPATED IMPACTS

The impacts of the Cooperative Geological Mapping Strategies on resource exploration and development are expected to be wide-ranging and are summarized below.

1. Increased Exploration Activity

It is widely acknowledged that the information provided by government geological surveys often leads to new exploration activity by the private sector. Although it is difficult to quantify this impact with any certainty, a recent analysis of the literature[2] provides a basis for estimation. Accordingly, it is estimated that every $1 million of government investment to enhance the geoscience knowledge base will likely stimulate $5 million of private exploration expenditures which, in turn, will result in the discovery of new resources with an *in situ* value of $125 million. There are no known studies that give analogous multipliers for oil and gas exploration; however, they would likely be the same or even larger.

2. Increased Employment

The value of job creation (direct and indirect) resulting from the additional exploration is estimated to be 47 cents per dollar of exploration activity based on impact multipliers of the Statistics Canada input/output model for services incidental to mineral extraction. This implies that each $1 million invested by governments in the strategies would result in 40 person-years of employment in the private sector. This is over and above the approximately 10 person-years of employment per $1 million expenditure generated directly by the government in program delivery.

3. Environmental

The geoscience knowledge that fosters resource exploration also provides important information for land-use planning decisions. The fact that necessary data are already "on the shelf" reduces both the cost and time required for environmental assessments.

4. Highly Qualified People

The industry has raised concerns about a shortage of geoscience graduates with appropriate field training. Government geological surveys have traditionally played an important role in training university students through summer field programs and support of thesis research. It is estimated that each $1 million in government investment would provide such training for five students.

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2 *Refinement and Validation of a Costs, Benefits and Impacts Model for the Targeted Geoscience Initiative*

Annex B

ECONOMIC AND TECHNICAL STRATEGIES

1. To increase investment in mineral and energy exploration

Provide a high-quality, unbiased geoscience knowledge base, aggressively market the program, and build a networked community of investors, explorationists, regulators, non-governmental organizations and program geoscientists.

High-quality, unbiased information reduces investment risk and provides a context within which to interpret claims made by exploration companies. Marketing raises the awareness of the availability of the information, and networking allows all parties to communicate and share the same basic government geoscience information. This helps avoid misunderstandings and facilitates problem-solving.

2. To stimulate new discoveries

Achieve technical objectives 4.5.1 and 4.5.3, use modern information technology to provide easy access to program data, and work closely with the exploration community.

Providing digital information in a timely fashion and in suitable formats allows it to be used effectively by the energy and mineral exploration sectors' sophisticated software applications. This helps reduce exploration risk and speeds up the discovery process. At the same time, it allows appropriate land-use decisions to be made, thereby supporting objective 4.4.

3. To identify new, previously unrecognized resources in mature areas

Achieve technical objectives 4.5.2 and 4.5.3, comprehensively integrate new and existing information in mature areas, and develop a new interpretation of mineral and energy resource potential in light of the most current geoscientific theories.

This type of approach has proven to be useful in the past. Close cooperation with universities will ensure awareness and use of current geoscientific theories.

4. To help ensure sustainable development

Aspects of the knowledge generated that are relevant to land access, land use, and environmental matters will be identified and brought to the attention of relevant parties.

5. To fill important gaps in surface and subsurface geological map coverage

Identify and prioritize needs with clients for each jurisdiction, develop a joint federal-provincial/territorial program to meet the needs (including quality standards), and implement the program and monitor progress through appropriate mechanisms in accordance with the principles outlined in Section 3.

Most of the mechanisms needed are already in place.

6. To allow presentation of the results to clients in a format that makes them easy to understand and use

The National Geological Surveys Committee, a cooperative committee of provincial, territorial and federal geological surveys, will continue to develop the Canadian Geoscience Knowledge Network (CGKN) to provide appropriate interfaces and links between the information technology infrastructures of the parties to establish a modern distributed information technology approach.

To maximize its utility, the geoscience information produced under the program will be readily available in formats that facilitate integration with other information. The CGKN will help the investment and exploration communities obtain easy access to geoscience maps and information on the information highway, and will develop mechanisms that allow one-window access to the information holdings of the various geological survey agencies. Each agency will continue to manage and maintain its own information holdings and identity.

7. Human resources

A creative human resources approach will help recruit new talent (*e.g.*, young scientist program) and enthuse and retain present staff. It will build capacity and develop and maintain skills that are in decline across Canada.

2000 Committee of Provincial Geologists

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